# JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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## EDITORIAL NOTES—GAS, &c.

### Industry and Coal Supply.

THE amount of injury that high coal prices inflict upon industry is incalculable, and certainly little understood, or even by many taken at all into consideration. The increased cost of manufacture is only one effect, the reduced demand brought about by the higher prices of our manufactures is another, the wider opening that those higher prices gives in our unprotected markets to foreign competitors is a third, and yet another is the consequent and deplorable restriction of the labour required. Increased prices for coal are brought about both by natural and by artificial causes; and, as in the present instance, sometimes by a mixture of both. It must be conceded to be only right that in times of general prosperity the colliery owners should, to a fair and reasonable extent, share in it; but through their combinations and understandings, there is a proneness to go to undue lengths. Retribution comes. High tides of prosperity in this country are not of long duration; and the enhanced cost of production in the manufacturing industries brought about by excessive coal prices, must inevitably cause the tide to turn much quicker than it would otherwise do, and suffering ensues through the slackness of work. With our manufactures open to attack on all sides, it is quite sufficient to have to bear the increases of price brought about by natural causes, without having to bear those also that are produced artificially. Increased wages for miners, and the greater depths from which coal has to be brought, are excellent reasons, so far as they go, for prices higher than the normal ones of the past; but even those conditions have been in a measure allayed by the application of scientific method to the work of winning coal.

However, such increases as are directly traceable to natural causes can be regarded with equanimity; but those engaged in industry in which large quantities of coal are used cannot but feel aggrieved when they are told that the prices that rule for coal at present are due, in no small degree, to the large foreign demand. The meaning of this is that the industrial prosperity of this country has to take second place to the demands for coal from other countries. There is something here perilously affecting national economics and interests that requires to be sharply set right. The tax on exported coal that was abrogated towards the end of last year seemed to be the opening of one road along which to do this. Before the tax was removed, the coal people were talking of the injury it inflicted upon their exports. The Board of Trade returns supplied the negation to their statements. Self-interest and not national interest played a large part in the destruction of the tax. No sooner was it ended, than the coal owners quietly pocketed the shilling per ton, and added on other shillings. Notwithstanding this, notwithstanding, too, that the colliery proprietors aver that in certain districts the most lucrative seams of coal are exhausted, the coal exports have, instead of being retarded by these conditions, continued to enlarge. The coal owners have, up to a point, played their cards well; but a relapse is bound to come, and that we believe quickly. The continued increase to the present in the exports proves that, having regard to current prices, the simple tax of 1s. per ton was not detrimental to the export trade; and the increase of exports at current prices upon the increase of exports of last year, suggests that the ruse of interested people in spreading abroad that the rise in price at the beginning of this year was only another step in prospective ascent, had its effect in creating a boom in the foreign demand on this country for coal. There is much about the position that is factitious; and the industry of this country is suffering in consequence.

The Board of Trade returns for the first three months of this year show that the coal, coke, and patent fuel exports amounted in the quarter to 14,314,264 tons; while in the corresponding period of 1906, they were 13,084,796 tons; and in the same period of 1905, 11,460,386 tons. The figures for coal alone were respectively 13,731,487 tons, 12,552,914 tons, and 11,041,534 tons. Of these quantities, the shipments of gas coal were respectively 2,056,797 tons, 1,784,616 tons, and 1,721,859 tons. Between the figures of gas-coal exports for the corresponding quarters of 1905 and 1906, there was not a remarkable difference; but in the three months of this year there has been a substantial difference. So far as gas coal is concerned, this increase has no doubt been under old contracts, and from panic buying. We are not anticipating, however, that, with current quotations for contracts, and increased freightage, the high export figures for gas coal will be maintained. The total exports for the three months are valued at £8,489,846, which is an increase of £1,400,000 on the value of the exports in the corresponding period of 1906—the average value per ton being in the respective periods 12s. 2d. and 10s. 9d. But the comparative value, having regard to the cessation of the coal tax, is as between 12s. 2d. and 9s. 9d. From these figures, it is not difficult to see what an important factor the foreign demand for coal is in the influences brought to bear upon home industry, and the contribution it makes to increased cost of production which has to be borne by home consumers. Let us instance the gas industry, as being the most suitable in these pages. The quantity of coal carbonized by statutory gas undertakings, according to the last issued Board of Trade returns (1905-6), was over 14,480,000 tons. Assuming that the new contracts for this quantity of coal are made at an average rise of 2s. 6d. per ton upon last year's figures, the rise alone will represent the enormous sum of £1,810,000. And this takes no account of the increase in the consumption of coal since the dates to which the returns are made up, nor of the coal consumption of non-statutory undertakings and works privately owned. But the calculation does indicate what an immense influence heavy fluctuations have upon large industries and upon the consumers of the produce of those industries.

The Miners' Eight Hour Bill which has passed the second reading in the House of Commons, and has been referred to the Standing Committee on Trade, is another menace to industry. This proposes a further limitation which those who can speak authoritatively on the subject characterize as unnecessary, and likely to produce a considerable amount of mischief. As to the necessity, the miners have proved themselves quite capable of taking care of themselves, without legislation, as to the number of hours they work; and the miners are not in all parts of the country favourably disposed to dictation as to the number of hours they are to labour. Various computations are afloat as to what this enforced reduction in hours of labour will mean in increasing cost; and they range between 1d. and 6d. per ton. But that increased cost will only be another excuse for a permanent increase in the price of coal—probably over and above the real amount represented by the altered condition of working produced if the Bill becomes law. The iron industry has already issued a protest. It is proposed, however, that the eight hours shall be reached by annual reductions—to nine hours in 1908, eight-and-a-half in 1909, and to eight hours in 1910. The Bill has been introduced to force the hands of the Government, whose movements are regarded as a little too slow by the active Labour members in the House, who, it is manifest, somewhat selfishly consider that their measures in the cause of labour, whether reasonable or otherwise, are of paramount importance, and should always have precedence in the deliberations of Parliament. Nor do they show any willingness to trust anyone but themselves. They do not trust the promise made upon this subject by the Government in the King's Speech, nor do they trust the issue of the Home Office inquiry that is now being fully made into this very question. When the Bill was introduced for second reading, Mr. Gladstone

stated that one important fact the Committee had ascertained is that the number of men who work eight hours or less is 131,000; while the number, including boys, who work more than eight hours is 449,000. When it is remembered to what a great extent the prosperity of the country depends upon the price of coal, it is pleasant to learn that the Government realize their duty to know how economic conditions will be affected before they take the responsibility of supporting a Bill which, if passed, will effect such a great change.

## Carburetted Water Gas.

The technical proceedings at the meeting of the Eastern Counties Gas Managers' Association last Thursday were peculiarly interesting. There were two papers—one on the "Manufacture of Carburetted Water Gas," by Mr. J. Davis, of Gravesend (the President-Elect), and the other on the "Lincoln Gas Undertaking: Twenty Years of Municipal "Control." There we have two subjects which invite an infinite amount of controversy; but controversy was largely stemmed by the omissions from the first paper of comparative figures as to cost and of the debatable effect from the consumers' point of view of a mixed supply of coal gas and water gas as compared with coal gas only; and by, in the second paper, the limitations imposed on the consideration of the general question of the policy of municipal trading by the adoption of the superlative illustration of administration—as municipally conducted—afforded by the Lincoln gas undertaking.

Notwithstanding the omissions referred to, Mr. Davis in his paper made out an excellent case of justification for the adoption of carburetted water-gas plant at Gravesend. No hard-and-fast rules can be laid down as to the advisability or otherwise of such a course. The bare figures as to comparative costs, and the bare figures as to the effects from the consumers' point of view, cannot be accepted as despotic arbiters, under all circumstances, regarding advisability. So much has always been admitted in these columns. Water-gas plant has its many conveniences; and it likewise produces its difficulties. But its regulative effect cannot be gainsaid; and, under the particular circumstances of each case, the point for consideration is not what are the gains and losses in comparison with the time preceding the adoption of the plant, but what are the traceable gains and losses under the circumstances—the changing circumstances—of the times during which the plant is in operation, based on the estimated results if the plant had not been in operation. The advantages of such plants, other than the question of cost, are described nowadays as both reflex and collateral; and reading Mr. Davis's paper and the contributions to the discussion by the users of water-gas plant, many such advantages will be found. Mr. Davis is quite satisfied that, but for the carburetted water-gas plant at Gravesend, the cost of the gas in the holders, if produced solely from the coal-gas plant as at present established, would be increased by quite 1½d. per 1000 cubic feet. The consideration as to whether this 1½d. counterbalances what the consumer may lose in respect of calorific value is not, of course, the whole question. There are the economies in interest, in wear and tear, in regulating operations—heating-up of the retorts and the employment of labour—in the retort-house at the times of exigent demand, and the control over the coke market. Without the influence of these factors, under a given set of circumstances, it is quite possible the consumer might more often suffer in respect of fluctuating price than he does from the loss he sustains in respect of calorific value.

The paper was a very practical one; and beyond the paper, no justification is sought for the correctness of the judgment of Mr. Davis when adopting carburetted water-gas plant instead of extending his coal-gas plant. He raised his productive capacity at a cost that would have been far exceeded had he pronounced in favour of coal-gas plant; and he realized at once a 30 per cent. margin in his retort-house power. But against this we have to set the fact that, until he expends further capital in duplicating his water-gas generating plant, he is in mid-winter throwing a heavy responsibility upon his water-gas plant; and he may, without the duplication—things will happen so—find himself in very uncomfortable straits at the most inopportune time. Moreover, we cannot avoid the opinion, looking at the figures he gave as to his working, that his results would be greatly enhanced by the freedom that additional generating plant would give him in maintaining a higher degree of efficiency. From the paper and the discussion may be picked several golden rules, the products of practical experience, which, if followed, will certainly improve the operation and results of carburetted water-gas plants. It was an excellent paper, and one which will repay very serious consideration.

## Ex Uno Disce Omnes.

In his paper, Mr. Mainwaring was on safe ground in confining himself to the discussion of municipal control as illustrated by the Lincoln Corporation gas undertaking. He, however, invites us from the one example to judge the whole, and that invitation we must respectfully decline. It can well be imagined that there are many gas engineers and managers of municipal gas undertakings who, after reading what Mr. Mainwaring and Mr. Carter (in the discussion) had to say on this subject, will ejaculate "Put yourselves in our "boots," and who would, indeed, gladly exchange livings with this fortunate pair. But do Mr. Mainwaring and Mr. Carter seriously think that the Lincoln Corporation and the gas-works administration of the city are typical of the whole? We say distinctly they are not. Neither the one nor the other can be accepted as a criterion. In its *personnel*, the Lincoln Corporation has not undergone, it was perfectly obvious to visitors on Thursday, that transformation that so obtrudes itself, in these times of advancing socialistic thought, ambition, and effort, in many other towns, and in which towns men totally unfitted for commercial direction by education, training, and ability, secure positions which give them paramount influence. If we regard Lincoln alone, or Lincoln and a few other places that could be named, then we can agree with Mr. Carter that the class of men from which councillors are drawn is the same class from which the directors of local trading companies are drawn. But unfortunately these places are not samples of the whole. In staid and respectable Lincoln, the high claims of local government to the best rulers that can be obtained, and to a conscientious discharge of votive duty, are transmitted and piously observed from generation to generation.

If we except such examples as Lincoln, and look at local authorities of different constitution, we should say that the differences—differences which have become more marked in later years—between the trading administrations of companies and local authorities are that, in the one, there is personal financial interest, a direct responsibility to a body of shareholders, and continuity of management, which is so absolutely essential in a commercial undertaking of a technical character; while in the other there is no personal financial interest at stake, there is no direct responsibility, such indirect responsibility as there is can be shaken off at will, and there is no stability in tenure of office. Moreover, the shareholders elect their own directors; if they do not elect the best, so much the worse for them and for their investments. Corporation Committees, on the other hand, are elected by the members of the Corporation, and not always because of their fitness for the office, but because political and other reasons have weight. It is owing to these things that there has been so much painful financial muddle disclosed at Local Government Board inquiries in connection with municipal undertakings other than gas-works, which undertakings have been founded and managed, be it marked, by the same class of men whom both Mr. Mainwaring and Mr. Carter, in their narrow yet favoured experience at Lincoln, hold up as immaculate public administrators. We may and do agree with them that, so far as the management of municipal gas-works is concerned, there is not much to complain about, other than the practice, without any sound defence, of transferring surpluses to aid the rates. But we do ask them to explain how it is that, under municipal management elsewhere, there is found so much financial obliquity in connection with certain trading undertakings that does not obtain in connection with gas undertakings? Is it that the gas undertakings get the elect of the members of the local authority for their administration? We say no. It is purely and simply due to the fact that municipal trading is not governed by such restrictive laws as are applied to commercial enterprise under private control, and that the effects of this liberty come out in the newer of the municipal enterprises more than in the old. Among the latter are the gas undertakings, which for the most part had their policy so well and firmly established in times and under conditions far different from the present, that that policy, being productive, has been allowed to go undisturbed.

Both Mr. Mainwaring and Mr. Carter put forward as an evidence of general good management in the case of

municipal gas undertakings, the fact that the average price charged to consumers was, in the case of a certain number of such concerns, lower by 2¾d. per 1000 cubic feet than in the case of companies. The argument is not an unfamiliar one; but really the surprising thing about it is that the average charge of municipal undertakings is not lower still. The fact of the matter is that municipal gas undertakings are, averaging them, in a superior position for business. Take the last Board of Trade returns relating to gas undertakings; and it is found that the average amount of capital employed by the 270 municipal concerns is £145,933, against only £96,063 employed by the 479 gas companies (omitting the three Metropolitan ones) operating in the Provinces and Suburbs of London. Mr. Mainwaring and Mr. Carter know full well what this considerably lower average capital signifies. Then if the comparison is carried further (to the business done, or to the consumers per mile of main), it all points to the same thing—that the average municipal supply district is of a more lucrative character than the average district of the Provincial Gas Companies. And, moreover, the municipal undertakings have the advantage, in instituting an average comparison, that so many of them nestle round the coal-fields, and occupy the majority of the large centres of industry. There is therefore no merit to be made out of this small average difference in charge under such circumstances; it should be—it might be, if there was not such hungering after surpluses for the rates—much greater. Who knows but what if private companies had districts of such good average character to serve, the average price of gas in them would not be lower still?

One more point regarding finance; and we admit that, on the figures before us, it is the only one which may be regarded as a blot on the financial administration of the Lincoln gas undertaking. Gas companies' dividends are limited; and those companies under the sliding-scale cannot pay the shareholders more dividend without reducing the price. That is an inducement not to carry forward large surpluses. A municipality governing a gas undertaking can transfer as much of their surpluses as they please in "aid" of the rates or administrative extravagance—even, as in the case of Manchester, to the laying of violent hands on their reserves for the purpose. In this connection, the remarks of the Chairman of the Police and Sanitary Committee of the House of Commons towards the end of the proceedings (as reported in our "Parliamentary Intelligence") on the Brighouse Corporation Bill should be heeded. For twenty years, the gas consumers of Lincoln have provided the capital for their undertaking; they have been discharging all the claims of sinking fund and interest; and the undertaking from the revenue has paid its proportion of rates. It is a gas consumers' undertaking—one that has been financed by them, and has had all its obligations met by them. Where, then, is to be found the justification for the £20,000 that has been handed over to aid the rates? The consumers have provided the means that have produced the conditions that have cheapened gas; and they—not the ratepayers who are not all consumers of gas—have, as consumers, the right to the utmost benefit resulting from those conditions. Many other interesting points were raised by the paper, that might be discussed; but the limit of space compels us to hold our hand.

## The Success of Tar on Roadways.

THERE is no lack of evidence that road authorities are now fully alive to the multiple advantages of tar, both for road construction and for surfacing and preserving existing roads. The dust nuisance, produced by the modern uses of the roadways, brought the matter into prominence; but the suppression of the nuisance by tar is found to carry with it other benefits. But no sooner was there the demand, than other means arose for effecting the primary object of applying tar; but they arose only to fall before the fittest in efficiency and durability. And the fittest, needless to say, is tar. We hear of big inquiries now for tar for road purposes; and the anticipation is entertained that in the present spring gas-works tar stocks will be considerably drawn upon in many localities for satisfying the requirements of the road authorities. But we do urge that the new business shall not be strangled in its very inception by any attempt to exact for the tar a price prohibitive to use. Such a course would be very injudicious. The new outlet is in process of being created; and it has to be encouraged, at the present time, to the utmost—with the view of ultimately largely relieving the market, and of assisting to place tar on that level at which better prices can be commanded.

The experience in surfacing roadways by tar was, up to last spring, almost entirely with hand labour; and local authorities looked askance at the cost. If hand labour could not have been superseded, it is pretty safe to say that the application of tar to road surfaces, through their enormous extent, would have been seriously curtailed; and it follows that the cheaper such application becomes, the greater will be the use of tar. But hand labour is doomed. Mechanical tar-spraying under pressure, there is every reason to believe, has already succeeded to the new place produced by modern conditions in the science and art of road construction and preservation, and nuisance suppression in connection therewith. By spraying, cost has been substantially reduced, the tar is economically applied, and it penetrates the binding material, transforming the surface of the roadway and two inches or so below into something approaching the characteristics of the upper crust of a tar macadam road. By this system of treatment, the tar as it were enters into amalgamation with the other constituents of the road—in such manner as cannot be hoped for by mere hand brushing. When there is only adherence and not impregnation, there is greater chance of cracking and buckling-up in wet and frosty seasons, and of softening in hot weather. Trials are now proceeding with tar spraying in many parts; and local authorities are well pleased with it. At Birmingham, as will be seen elsewhere, the City Surveyor has been authorized to spend a considerable sum of money in applying the system. The direct advantages and collateral economies are many. But the new practice is still in its infancy; and, however great the economies, the initial outlay will be considered well by local authorities. The prospects are good; and in tar dealings at the present time let there be wisdom. The gas industry wants this new business; and prudence will secure it.

The use of tar by spraying and in other ways for road purposes formed the subject of an instructive paper by Mr. A. Dryland, the County Surveyor of Wiltshire, at a conference of municipal engineers on Friday, at the Building Trades Exhibition. The paper is published in this issue.

## The Manchester Exhibition.

The prospectus of this exhibition has been issued; and in it there is every indication of the preliminaries being approached with a breadth of view, and under influential patronage, that should ensure success in organization, and ultimately, through the populous area of which Manchester is the centre, of the exhibition itself. The Advisory Committee of the Manchester Institution (of which Committee Mr. Thomas Newbigging is Chairman) is a strong one; and the same remark applies to that of the Society of British Gas Industries, the President of which (Mr. Dugald Clerk) is also at the head of the Society's Committee. The large Corporations and Gas Companies in the area are giving their countenance. All that is required now is for the workers to put their shoulders to the wheel; and, being of the Manchester district, that they will do so is as certain as anything can be. Details from the prospectus are given in another column.

## An Opportunity Missed at the Building Exhibition.

A visit to the Building Trades Exhibition, which closed last Saturday at Olympia, where gas and appliances in connection therewith were conspicuous by their absence, conveys the impression that the use of gas is not pushed so energetically as it should be This is to be regretted, as here surely an opportunity was afforded for gas companies to display their wares; for a more influential body of people, from their point of view, could hardly have been gathered together. Here were to be seen architects, surveyors builders, engineers, and others—many of them doubtless visiting the exhibition for the purpose of inspecting the latest and most up-to-date methods of heating, lighting, and ventilating rooms, offices, greenhouses, &c., of heating water for house and bathroom use, and of treating roads to solve the dust problem. A stand, occupied conjointly by the London Gas Companies, and fitted up with all the best types of stoves, fires, lamps, hot-water circulators and gas-engines, and arranged to demonstrate the commercial uses of tar for road and other purposes, would have been the best of advertisements, not only for themselves but for the whole gas industry. This display could not, we think, have failed to be

productive of far-reaching results; and any outlay would surely have been well repaid. "Coalite" was conspicuously advertised; and anthracite stoves, kitchen-ranges, and sitting-room grates were to be seen everywhere. But, as was pointed out in the "JOURNAL" last week, it was "only here and there" that anything in which gas could be used for heating was detected, and then it had to be "searched out." It is therefore hoped that, at the next exhibition devoted to the building or allied trades, the London Gas Companies will consider it advisable to demonstrate the undoubted advantages and economical uses of gas for lighting, heating, and power purposes, introducing, as far as possible, the special properties of coke, tar, and other bye-products.

## South Metropolitan Assessment Appeal.

On five days now, at the County of London Quarter Sessions, Clerkenwell, Mr. Robert Wallace, K.C., and some Magistrates, have been engaged in hearing an appeal by the South Metropolitan Gas Company against the assessment of their property in the Woolwich and Greenwich Unions and the Boroughs of Lewisham and Bermondsey. The first three days' proceedings were reported in the "JOURNAL" for March 12; and the other two are dealt with to-day. The hearing is to be resumed next Monday; and it may be anticipated the respondents' case will soon be reached. The evidence so far called for the Company has been of an interesting character. Valuations have been submitted by Mr. Arthur L. Ryde, Mr. W. A. M'Intosh Valon, Mr. E. Herbert Stevenson, and Mr. H. E. Jones; while evidence has also been given by Sir George Livesey and Mr. Frank Bush. Much of the evidence has been with regard to the prepayment branch, which, of course, has now become a very large portion of the Company's business; the argument being that these meters and the fittings which are supplied with them—in fact, everything included in the prepayment installations—should be put down as tenant's capital, in the same way that ordinary meters were in the celebrated Lee case. The greater part of Tuesday last was occupied by Sir G. Livesey's examination and several cross-examinations by Counsel appearing on behalf of the various respondents. It was pointed out by Sir George that he appeared in that Court "6½ parts representing the consumers and 1 part only the shareholders"—owing, of course, to the operation of the sliding-scale; and he proceeded to give very plain expression to his opinion that the present assessments of gas are excessive, and that there is no reason why the industry should be higher rated than anything else. "The gas consumer," he remarked, "is the most unfortunate individual in the kingdom." One point in his evidence which is of interest quite apart from the question of rating, is the statement that the price of gas will have to be raised again in the middle of next winter, owing to the increased cost of coal.

## Retrograde Finance at Manchester.

The Manchester Corporation are bent on having their "full pound of flesh" from the Gas Department in aid of the rates. Alderman Gibson, the Chairman of the Gas Committee, has doughtily championed the rights of the gas consumers to the benefit of surpluses; but without avail. The Gas Department has over and over again satisfied all the compensation for any supposed financial responsibility that the ratepayers took upon themselves at the time the gas undertaking passed into the hands of the Corporation, by having transferred since 1844 from surpluses in relief of the rates a sum short only by under £200,000 of £3,000,000. Last year the department paid into the city fund, free of income-tax, £60,000. The increase of 2s. 6d. a ton in the price of coal will cause an additional expenditure this year of £40,000; and therefore the estimated surplus on revenue account for the year ending March, 1908, is down to £20,677. The reserve fund of £61,127 (which is not any too large for a concern of this magnitude), it is proposed shall be sacrificed to the extent of about £30,000, to enable £50,000 to be handed over to the rates during the current financial year. Both in good and indifferent times, the Corporation are evidently minded to have the "full pound of flesh." It is a serious thing, and retrograde finance, to reduce a reserve to such narrow limits for so important an undertaking. Suppose the price of coal continues another year at the present high figure, supposing, too, some untoward circumstance occurs for which the reserve fund should be available, what will happen then? The price of gas will have to ascend, because the protection that should be afforded to the consumers by the savings (provided by them) of the past have been swallowed up by the city fund. The electricity undertaking does not contribute anything to the relief of the rates; but the electricity consumers will gain by this plundering of the gas consumers. It is, in our opinion, a matter for very serious protest.

## Association of Municipal Corporations.

The annual meeting of the Association of Municipal Corporations held last week (a report of the portions of which that are of interest to "JOURNAL" readers appears in another part of to-day's issue) was, as is usually the case, very well attended. But this is not to be wondered at, when it is considered that the Association now represents no less than 295 towns; and in many cases the corporations who send delegates nominate more than one person to attend. The business on the present occasion did not take up a great deal of time; in fact, it could not be said that all matters brought forward were new questions to the members. This, however, is not necessarily an objection to their appearance on the *agenda*, for the Association are desirous of securing reforms in various directions, and it would be too much to expect that this could be done "at the first asking." The most notable cases of reiteration were the references to the auditing of municipal accounts and to the repayment of loans for water-works purposes. The newly-elected President was Mr. J. Harmood-Banner, M.P., of Liverpool, who was well qualified to speak on the subject of auditing—which, in moving the adoption of the report and accounts, he did at some length. He remarked that the question of an independent audit was not receiving the attention that it deserved—particularly in view of the recommendation in 1904 of the Joint Committee on Municipal Trading that professional auditors should be appointed in place of the present elected ones. He emphasized the desirability of employing professional auditors and of inaugurating a plain and full form of accounts, which would enable those who looked through them to easily understand the real position of the local authority and the undertaking to which they referred; and it must be admitted that the Association have done their best to urge in official quarters the need for some change in the existing system. As to the resolution asking easier terms for repayment of loans for water-works purposes, which was brought forward on behalf of Halifax, the suggestion was so absolutely in accord with the feelings of the meeting that those present listened impatiently to the repetition of the arguments in its favour. This is a further case in which the Association have done everything in their power to gain the ear of the Local Government Board, but so far with conspicuous lack of success. Still another matter the Association have open with the Board—and that is the recently issued circular with regard to the payment out of borrowed money of wages of permanent workmen. This is a more recent grievance; but it is being actively taken up by the Law Committee. Altogether, it will be generally agreed that the Association have plenty of work on hand; but at the same time there is no sign of any slackening in their efforts to fulfil the task to which they have set themselves.

## More Views on Depreciation.

Those of our readers who are specially interested in the question of depreciation will find ample material for study in the lecture by Professor Dicksee, from which some extracts were given in the last number of the "JOURNAL," and in the paper by Mr. P. D. Leake, F.C.A., which is fully noticed in another part of the present issue. The former gentleman, it may be remembered, addressed himself to students, and he laid down certain principles for their guidance in dealing with a subject which presents not a few difficulties. He considers, as we gather from his remarks, that the statutory sinking fund is inadequate to keep an undertaking going, and that, in addition, something should be charged against revenue in order to equalize the expenditure to be incurred for the renewal of what he calls "short-lived" assets. Mr. Leake, whose views on the question were laid before the Institute of Directors, does not consider either the annuity or the sinking fund method suitable for what he designates as "measuring expired outlay on productive plant." He suggests that joint-stock and municipal undertakings should be required to keep a register showing the economic life-period of each portion of plant; and some specimen pages were appended to the full text of his paper. Such a register would certainly present to an inquiring shareholder or ratepayer a great deal of information

which he might otherwise seek in vain. The author, it will be seen, deals with the subject of municipal trading and depreciation; taking for the purpose of illustrating his remarks the case of an electric tramway undertaking conducted respectively by a limited company and by a municipal authority. Both the lecture and the paper present views of the depreciation question which are worthy of attention; and we leave them to the consideration of our readers.

## PERSONAL.

Mr. WALTER SHADBOLT, of Horncastle, has been appointed Manager of the Llandudno Gas-Works, in succession to Mr. Thomas Davies, who, as already announced in the "JOURNAL," has resigned. His duties will commence on the 23rd prox.

An interesting wedding took place on Tuesday last, at the parish church of Nanterre, near Paris; the parties being Mdlle. YVONNE LHOMME, daughter of the well-known Engineer of the Nanterre Gas-Works (M. Paul Lhomme), and M. MARTINEAU, the Manager of the Poissy Gas-Works—a member of the Société Technique de l'Industrie du Gaz en France. There was a reception and lunch afterwards, at which were present most of the leading personalities of the locality.

We learn that Mr. JAMES HUSBAND is relinquishing (on a retiring allowance) his position as Engineer and Manager of the Brentford Gas Company. His association with the Company extends to nearly a quarter-of-a-century—from, to be precise, 1884. From 1888, he was Assistant to Mr. Frank Morris, then Engineer and Manager; and on the elevation of this gentleman to the Board in 1897, Mr. Husband succeeded to the office that he has held until the present. The period of Mr. Husband's connection with the Company covers that during which the inclined-retort system of carbonizing was introduced into this country at Brentford, and consequently of the active developing work upon that system that was done by Mr. Morris and those associated with him at the time. In Mr. Husband, the inclined-retort system, constructed on the simplest lines, has always had a staunch adherent.

It may be remembered that about a year ago Mr. F. W. Chamberlain resigned his position as Engineer and Manager of the Bombay Gas Company, and was succeeded by Mr. A. R. Burch, formerly of Uxbridge. The Directors now announce some further changes in connection with the management. Mr. J. HILL PERRINS has, owing to advancing age, retired from the office of Secretary, which he filled for 25 years, and Mr. ALEXANDER DICKSON, JUN., lately the Secretary of the Kent Water-Works Company, has been selected to fill the post. In making this announcement, the Directors record their high appreciation of Mr. Perrins' services to the Company, extending over the long period of 45 years. Mr. Dickson has recently returned from a visit to the works in Bombay, where, in conjunction with Mr. Burch, he has introduced a system of collection and accounts which the Directors believe will preclude the recurrence of fraud, of which the Company have been victims. One of the Company's Auditors—Mr. G. EVAN ROBINSON—has resigned his position owing to physical infirmity; and Mr. Perrins has been provisionally appointed to fill the vacancy.

**Wales and Monmouthshire District Institution of Gas Engineers and Managers.**—We learn frem Mr. Octavius Thomas, the Hon. Secretary, that the annual meeting of the Institution will be held at Neath on Wednesday, the 1st prox., under the presidency of Mr. R. A. Browning, of Neath. The business will consist of the election of officers for the ensuing year; the further discussion of Mr. Walter Lister's paper on "A Dust Preventer for Public Roads," read at the meeting held at Swansea last September; and a paper by Mr. G. Mayne on "A Method of Using Air to Revivify Oxide *in Situ*," with a discussion thereon.

**German Association of Gas and Water Engineers.**—It is officially announced that the forty-seventh annual general meeting of the Association has been now fixed to take place at Mannheim, from the 11th to the 15th of June next. The meeting will open with a reception by the President—Herr J. Nolte, of Berlin—on the evening of the first-named day. The technical proceedings, of which the programme will be announced later, will occupy the next three days, and the meeting will conclude with an excursion on Saturday, the 15th. The instructional and experimental gas-works of the Association at Carlsruhe, which is within easy access of Mannheim, will be open for inspection during the meeting.

**The Sheffield Coal Company, Limited,** write stating that it has recently come to their knowledge that large quantities of "Birley Coking Slack" are being offered on the London market; and that as no coal of this description is procurable (it being all coked by themselves), it is evident that another article is being put forward under their name. The Company point out that a certain amount of fine "smudge," deposited in the settling-ponds connected with the slack washer, has been sold, and is being exported by two firms of standing, who certainly would not offer this material as "Birley Coking Slack," worth a much higher price. By making the facts public, it is hoped that the trade generally will be saved some misapprehension and inconvenience,

## MANCHESTER GAS EXHIBITION.

We have just received a copy of the prospectus of this exhibition, which will be held, under the patronage of the Manchester District Institution of Gas Engineers and the Society of British Gas Industries, in St. James's Hall, Manchester, from Oct. 3 to Nov. 9 next. The Advisory Committee of the first-named body, of which Mr. T. Newbigging, M.Inst.C.E., is Chairman, consists of the following members: Messrs. J. H. Brearley (Longwood), J. H. Crowther (Wallasey), T. Duxbury (Oldham), S. Meunier (Stockport), J. G. Newbigging, M.Inst.C.E. (Manchester), W. Prince (Stoke), and W. W. Woodward (Salford). The members of the Advisory Committee of the Society of British Gas Industries are: Messrs. Dugald Clerk, M.Inst.C.E. (National Gas-Engine Company, Limited), Charles Clare (Messrs. Fletcher, Russell, and Co., Limited), J. W. Broadhead (Messrs. Robert Dempster and Sons, Limited), Thos. G. Marsh, Fred J. West (West's Gas Improvement Company, Limited), John Mackay (Messrs. Alder and Mackay), and John E. Williams (Messrs. John E. Williams and Co.). The Joint Honorary Secretaries are Mr. H. Kendrick (Stretford) and Mr. W. Whatmough (Heywood); and the Exhibition Manager is Mr. Walter Cawood. The list of patrons of the exhibition consists of the Gas Committees of the Corporations of Manchester, Salford, Oldham, Bolton, Stockport, and Bradford, the Liverpool and Sheffield Gas Companies, and a number of neighbouring gas undertakings.

The Advisory Committee are desirous of making the exhibition an object-lesson to gas-fitters, plumbers, manufacturers, architects, and all those who are interested in smoke prevention. They point out that in the solution of the smoke problem, the manifold domestic uses of gas have already gone a good way; and the latest appliances to this end will be on view. In general, it is intended to show the service gas can render to the manufacturer, the professional man, the merchant, the shopkeeper, and the private resident, whether in cottage or in hall. Cookery lectures and demonstrations, and lectures on the uses of gas in various trades, will be arranged for; and, if possible, scientific and popular lectures also.

As there has not been any really representative gas exhibition in the Manchester district before, and having regard to the great developments which have taken place in connection with the industry of late years, the Committee hope that there will be shown a great number of important manufacturing appliances, machines, and processes using gas for various industrial purposes. How important is the area this proposed exhibition is intended to serve will be recognized from the fact that within a radius of 25 miles from the centre of Manchester there is a larger population than in any similar area in the world.

The following are among the divisions and classes into which it is proposed to group the exhibits:—

I.—LIGHTING.

*Class* 1.—Public Street and Open-Air Lighting: Artistic, serviceable, cheap and decorative lamp-posts; combinations of street-lamp posts with other street service utilities; brackets, suspended lamps suitable for railway stations, &c.; lanterns, decorative and useful, for outdoor use; reflectors, refractors, shades, glass, and glazing; lighting devices, lanterns specially adapted for particular systems of gas lighting, shadowless and storm-proof lanterns; high-power gas-lighting, with or without mechanically assisted pressure; combinations of high and low power lights; anti-vibrators.

*Class* 2.—Interior Lighting: Decorative and special lamps and fittings for churches and for municipal and other public halls; artistic gas-fittings for domestic lighting; incandescent and regenerative burners, and self-luminous burners for all grades of gas; high-pressure lighting systems, self-lighting burners, and devices for lighting gas from a distance; safety extinguishing devices; reading and professional lamps; inverted burners; watch and pilot-light improvements; globes and glasses; chimneys; incandescent mantles, and their manufacture; factory, shop, and warehouse lamps and lighting; window lamps; governors, regulators, and indicators of all kinds.

II.—COOKING, HEATING, AND VENTILATION.

*Class* 3.—Cooking by Gas: Confectioners' ovens; gas-cookers for hotels, clubs, hospitals, schools, and other purposes; special gas-kitchener accessories; applications of gas to various domestic purposes; systems for hot-water supply throughout houses; water-heaters, rapid or slow, gas-heated baths; washing-boilers.

*Class* 4.—Gas-Fires and Heating-Stoves: Combinations of gas-fires with cooking-stoves and coal-fires; gas-radiators, condensing stoves, ventilating stoves, greenhouse stoves, stoves adapted to particular uses; accessories.

*Class* 5.—Gas as Applied to Ventilation.

III.—MOTIVE POWER.

*Class* 6.—Gas-Engines: Gas power applied to printing, pumping, ventilating, driving dynamos for electric lighting, &c.

IV.—APPLICATIONS OF GAS TO INDUSTRIAL PURPOSES.

*Class* 7.—Gas-muffles, hot-plates, workshop stoves, tinmen's stoves, crucible furnaces, melting furnaces, blowpipes, tobacco-drying, roasting of coffee, calendering, shirt-ironing, gas-iron

heating for laundries and clothiers; frames for "gassing" yarns; hatters' machinery, type-founding, paper-staining, japanning, lacquering, enamelling, brazing, photographing, and gas traction; machinery and processes of using gas; various apparatus enabling incandescent gas-lights to be used in textile and other factories.

V.—Residual Products of Gas Manufacture.

Coke-burning stoves and fire-grates; coke breeze concrete, briquettes. Tar and its uses; tar products—drugs, dyes, naphthalene; naphthalene tests and methods of prevention; ammonia, cyanides, and carbon.

VI.—Models and Testing Apparatus.

An attendant will be provided by the Advisory Committee and space for accepted exhibits free of cost.

## GAS STOCK AND SHARE MARKET.

**(For Stock and Share List, see p. 256.)**

It cannot be said that last week brought any improvement in the aspect of affairs on the Stock Exchange. From start to finish business was very quiet and repressed; and by the close it had reached its smallest volume. Then a degree of dullness overshadowed the markets, almost unrelieved even briefly by a brighter ray. The week opened poorly, though not uniformly lower; and the number of new issues in the air had a somewhat distracting influence. This was apparent next day in the Consols and gilt-edged departments; and on Wednesday the tendency was still downward. The general attitude then became listless, awaiting developments; and so the week dragged on, with prices mostly getting lower. Consols suffered by support being withdrawn through the attractions of the London County Council new loan; and, thus led by the premier market and the gilt-edged division in sympathetic harmony, all departments drooped to the close. In the Money Market, there was continuous ease, with a superabundant supply always on hand demanding occupation; so that rates for short loans became very light, and there was marked ease in discount. A reduction in the Bank rate soon is looked upon pretty well as a certainty. Business in the Gas Market was again quite moderate and devoid of all animation. But the market did not show any sign of weakness for lack of support; and the general tendency both in London and the Provinces was an improving one, though here and there an issue was otherwise moved by special circumstances. In Gaslight and Coke, the ordinary was only moderately dealt in; but it stiffly adhered to the figures it had been commanding, and all transactions were within the limits of $95\frac{3}{4}$ and $96\frac{3}{8}$. Rather more activity was apparent in the secured issues; but they were prejudicially affected by the droop in high-class investment stocks. The maximum changed hands at 88 and at $87\frac{3}{4}$ special, the preference was a point lower at from 106 to $104\frac{5}{8}$, and the debenture marked 84 and $84\frac{1}{4}$. South Metropolitan was very quiet but firm; transactions ranging from 122 to 123—a rise of 1 in the quotation. The debenture was done at 86 free, and then at $84\frac{1}{2}$. Commercials were scarcely noticed—one bargain in the 4 per cent. at 109 and one in the $3\frac{1}{2}$ per cent. (marked $103\frac{1}{2}$, probably a misprint for $105\frac{1}{2}$) being all the business. In the Suburban and Provincial group, Alliance old was done at $20\frac{3}{4}$ (a fall of $\frac{1}{2}$), Brentford old at 252, Brighton original at 223 and 224, and British at $42\frac{5}{8}$ and $43\frac{1}{4}$ (a rise of $\frac{1}{2}$). On the local Exchange, Newcastle had a smart advance, and South Shields a moderate one. Among the Continental Gas Companies, there was little doing. Imperial changed hands at from $178\frac{1}{2}$ to 180, European fully-paid at 24 special, Cagliari at $24\frac{1}{2}$ and 25 (a rise of 1), and Tuscan at $10\frac{3}{4}$. Among the undertakings of the remoter world, Buenos Ayres marked $11\frac{1}{8}$ and $11\frac{5}{8}$, ditto debenture $95\frac{1}{2}$ (a rise of 1), Primitiva from $8\frac{1}{16}$ to $7\frac{3}{8}$ (a fall of $\frac{1}{2}$), ditto preference from 5 to $5\frac{1}{8}$, ditto debenture 96 and $96\frac{1}{2}$, and River Plate from $13\frac{5}{16}$ to $13\frac{1}{2}$.

## ELECTRIC LIGHTING MEMORANDA.

**The First Step, and the Results—To Capture Shop Lighting—Running Amuck of Practical Tests of Cost and Efficiency—Breaking the Strength of Private Enterprise in Vienna—Carmarthen Town Council's Mistake.**

There are first steps which, in one's personal interests, it is well should not be taken. Such a first step often compels a second, a third, and so on, until the weight of the results of the progressiveness becomes so burdensome that one has occasion to deeply deplore the original step. It is a practice with some electric light undertakings to offer to do certain things, as they put it, "free of cost" to the householder, in order to obtain an entry into his premises. But the householder may rest assured that the expression "free of cost" is a blind, and that in some way the electricity suppliers will recoup themselves. As commercial undertakings, they cannot afford to do anything free of cost. The "free-of-cost" line of doing business is only the thin end of the wedge. Once that thin end gets inserted, there will be little peace until the wedge is driven further home. The South Metropolitan Electric Light and Power Company, whose operations extend over a large area in South London, and who have not met with such an amount of success as they could have desired and the shareholders expected, are making a renewed effort to get in the thin end of the wedge among the householders in their district. It is a very fine end indeed that they are trying to force in; but it will suffice for their purpose. "Dear Sir or Madam" is informed that the Company are prepared to instal in his or her premises a "complete" installation of "six" lights, including the necessary wires, fittings, lamps, shades, and switches, absolutely free of cost; and it is hinted that should the requirements of "Dear Sir or Madam" exceed six lights, then gas-fittings can almost invariably be easily adapted for the use of the electric light at a trifling cost, or additional lights can be installed at a small rental per annum. The six lamps to be installed are of 16-candle power. The disposition of these lights it is proposed shall be: One in the hall near the front door, one in the back hall, to enable persons entering the house to do so without personal injury; one lamp in an adjoining room, evidently to just enable one to move about the room without knocking up against the furniture; and three in the front room, which will, under the scheme, be the only habitable room during the hours when artificial light is required.

Such an installation, except in a bijou residence, cannot be of any use whatever, excepting to run away with a cost of about 6d. every three hours for electricity (without including renewals and maintenance), to give a total scattered light of 96-candle power at the best. It is the first step; and the householder will find before his first winter quarter has passed, and the account for that quarter has been presented, that he must have many more lights. A 16-candle electric lamp does not sustain its nominal lighting power; and a 16-candle electric light is not, nor are three that are not up to their rated efficiency, at all adequate for the illumination of a room, if the occupants are to see, without straining their eyes, to perform their varied duties or to enjoy the recreation upon which they are bent. Taking the average consumption of electricity at 4 watts per candle per hour (and we know that the consumption does not stop at that), each lamp would consume 64 watts per hour; the six 384 watts per hour; and therefore, as consumers having a six-light installation absolutely "free of cost" are to pay 6d. per unit, and as 1000 watts are equivalent to a unit of electricity, three hours' lighting will absorb 6d. But that is not all. The meter-rental is to be 8s. a year; and, further, the householder is to be liable for repairs, maintenance, and renewals. The lamps would require renewing about three times a year, in order that electricity shall not be unduly wasted; so there we have another 18s. to £1 to find for renewals, supplemented by anything that may be required for repairs and maintenance. That is only the first step. What it may lead to before the uninformed householder knows exactly where he is, can readily be calculated, according to the requirements, from the foregoing figures. The total insufficiency of the lighting provided under the first step, is the assurance that the Company have, after gas-fittings have been abolished, and the householder has had his place upset by the change of system, that further business will follow. The householder's repentance comes with his progressive experience. It might be added that if the 6d. was spent every three lighting hours on gas at 2s. 6d. per 1000 cubic feet, the householder could use 66 cubic feet an hour, could fit 22 decent incandescent burners about his house, and obtain a total illumination of 1300 candles.

The Company are also making a further attempt to obtain favour among the shopkeepers in their district. But there rise darkly before the shopkeepers the experiences of last Christmas, when, in the midst of the most busy retail trading season, those shops in the district (as in Oxford Street through another cause) that were lighted solely by electricity were completely deprived of light by a boiler explosion. The sympathy of everybody was with the Company on the occasion; but, at the same time, shopkeepers have to look after their own interests first. The Company are now offering tradesmen the inducement of a discount of 30 per cent. off accounts for electricity used in shop lighting; the ostensible view being that shop lighting is a good advertisement for electricity. The discount is only to apply to those tradesmen whose demand is constant, and who are being supplied at a flat-rate of 5d. The discount will therefore reduce the price to somewhere about $3\frac{1}{2}$d. per unit; and, by paying a rental of 2s. per quarter, a tradesman can also have a six-light installation put in "free." The word "free" seems to have a variety of meanings when dealing with electricity. The considerations in the foregoing paragraphs, and in the one that succeeds this, will apply to this essay to capture the shop lighting in South London.

Certain electrical representatives have burnt their fingers badly over some tests that have been made at the new works of the Sunbeam Motor Company at Wolverhampton. The Company were in a quandary as to which light to adopt, electricity or gas—the Corporation Electricity Department asseverating that they could supply them with the cheaper and more efficient illuminant; and the Wolverhampton Gas Company appear to have asserted that this was either a mistake or a fabrication. The Sunbeam Company were indisposed to question offhand the veracity of either party; and so they determined upon the practical course of putting the assertions to the test. They scattered to the four winds all nominal and asserted candle powers, and trusted to meters to show them the quantities of gas and electricity used in a given time, and to their own organs of vision for judgment as to the relative performances of the lights to serve their requirements. The Sunbeam Motor Works are run by sensible people. Two so-called 500-candle power electric lamps were set to work to

do their best for 60 hours, against two 300-candle power incandescent gas-lamps; and gas came out more than the conqueror. The "Electrical Engineer" tried to belittle the tests in an article, in which this statement appeared: "We made inquiries into the matter, and find the lamps were run for a certain time, as stated, but no test worthy of the name was taken, inasmuch as the Electricity Department has absolutely no record of the respective hours of burning, of the quantity of gas consumed, the price of the gas, or the candle power of the gas-lamps." The Sunbeam Company have caused the writer of the quoted statement to drop ignominiously from his perch. They have written a letter to our electrical contemporary, in which they assert that a proper test was taken; that the lamps were specially fixed for the test; that the reading of the meters in each case was taken by a representative of the respective competitors; that a representative of the Sunbeam Company checked the readings of the meters; and that the result was that, in the sixty hours, 1200 cubic feet of gas were used, which, at 2s. 6d. per 1000 cubic feet, cost 3s., and 40 units of electricity were consumed, which, at 3½d. per unit, cost 14s. 3½d. The consumption of gas therefore works out to exactly 10 feet per hour for each of the two 300-candle power lamps—showing an efficiency of 30 candles per cubic foot of gas consumed, which is the claim made for high-power lamps of the type employed. As to the inquiries made by our contemporary, the Sunbeam Company deny that any inquiries were made at their works, which is the place where the tests were made. Of course, if the Sunbeam Company are allowed to use for lighting up to 10 per cent. of the quantity of electricity consumed for power at 1d. per unit, that would considerably reduce the cost for electricity. But our contemporary still asserts that "the figures are quite valueless without photometrical tests of the candle power obtained from the rival sources of light." Photometric efficiency is not a test of practical efficiency; and the Sunbeam Motor Company, knowing what they want, have seen, and have been satisfied.

A tale has recently been told in the "Electrical Review" which brings forcibly to mind the treatment received by the Imperial Continental Gas Association some years ago at the hands of the Municipality of Vienna. Vienna is not a place where just treatment is to be expected by private enterprise in serving the public; and what the "Review" says confirms the views expressed in the "JOURNAL" at the time the Imperial Continental Gas Association received their discharge from the city. The facts regarding the present developments as applied to the electricity undertakings in Vienna are taken from the article in our contemporary. The three Electric Lighting Companies in the city, it seems, were allowed to develop their undertakings undisturbed until the municipal authorities started a generating-station of their own. Then all sorts of obstacles were placed in the way of the Companies to hamper their further progress. They were prevented from making fresh extensions of cables, and new connections to them. Controversies and legal proceedings, and even street battles between workmen, ensued—in fact, everything was done to weary the Companies. The municipal tactics succeeded in the case of one Company, who agreed to sell their undertaking to the Municipality. Nominally, there has been peace since. But the magisterial department has prohibited the undertaking of street work by the Companies; and this suggests the revival of the lively proceedings of a few years since. The only object of all this can be to cripple the two remaining Companies, so that they may become easy prey to the Municipality. The result will not be good for the consumers of electricity; for those served from the municipal work have, says the "Review," to pay a high price for supply, in order to find money to pay the interest on the heavy debt hanging over the city. History certainly repeats itself in Vienna in the matter of the treatment meted out by the Municipality to private enterprise.

The Carmarthen Town Council, in what we believe to be pure ignorance, have committed the town to a scheme of electric lighting for the streets, which they do not understand; and the "Carmarthen Journal" gives them its support also without, we again fear, understanding the subject. We are led to these conclusions by certain remarks made in the Council and in the paper in question. For example, we find Mr. Blagdon-Richards, in the Council, saying: "Gas cost the private consumer 4s. 1d., and then there were the mantles to buy; while the private consumer could get electricity into his house at 3s. 6d." This is not very informative; but we take Mr. Blagdon-Richards to mean that the cost of electricity would be equivalent to a charge of 3s. 6d. per 1000 cubic feet of gas. Of course, Mr. Blagdon-Richards assumes that once electric lamps are put up they will go on, like Tennyson's brook, for ever. Then the "Journal" in question says that: "As to private consumers, the electricians undertake that they will supply light to them at a much cheaper rate than gas—in some cases, two-and-one-third times cheaper." Now let us see how far the honourable member of the Council and our local contemporary are right. We will make a little comparison which may cover both the public and private lighting. Supposing ¼ ampere Nernst lamps are used—giving a photometrical value when new of 17 candles. It is found that such a lamp consumes 50 watts of electricity per hour, so that one lamp giving only 17 candles when new could be run on one unit of electricity for 20 hours, which we will suppose is to cost private consumers 5d. and the public lighting 3½d. All the calulations here take no account of renewals and maintenance which are heavy in the case of electricity. Take a ½ ampere Nernst lamp, giving on photometrical test 40-candle power, it will consume 85 watts per hour, so that a unit of electricity will be expended in less than twelve hours. Take a Tantalum electric lamp giving photometrically 19-candle power, and using 38 watts per hour, it will absorb a unit of electricity in 26 hours. An ordinary 16-candle carbon filament lamp, using 64 watts per hour, will use up a unit of electricity in less than 16 hours. Take the most common form of incandescent gas-burner, using 3 cubic feet per hour, and giving a light of 60 candles, it will run on 100 cubic feet of gas, costing 5d. in Carmarthen, for 33 hours. Put another way, with gas at the price in Carmarthen, a consumer can if he desires use 33 burners of 60-candle for an hour for 5d.; or for 5d., with electricity at that price per unit, he can use 20 ¼-ampere Nernst lamps of only 17-candle power each; or he can use 12 ½-ampere Nernst lamps of only 40-candle power each; or he can use 26 Tantalum lamps of only 19-candle power each; or he can use 16 16-candle carbon filament lamps. The life of Nernst and Tantalum lamps are uncertain; they are expensive to buy a number; and the Nernst are very troublesome in use. Carbon filament lamps, if the consumer wishes to be economical, should be renewed three times a year, at from 1s. to 1s. 3d. each, which price must therefore be multiplied by three, and then by the number of points of lighting in a house, to get the cost of renewals. Incandescent mantles are cheap; and their renewal does not mean the renewal of the whole lamp. Which now is the cheaper light, even at the price charged for gas in Carmarthen? It is little use attempting to discuss the public lighting; as the details of the figures for electricity are not before us. But the £2 17s. 6d. tendered by the Gas Company for 70 to 100 candle power lamps is reasonable; and we are confident the Electricity Company cannot do better. We challenge the production of their figures. It is the duty of the Council not to show paltry spite by accepting the contract of any company; but to get the greatest value possible in all the public services for the money expended. On this occasion, they have, we think it could be easily proved with the figures before us, made a great mistake.

## Production of Cerium.

It may be remembered that in the "JOURNAL" for the 19th ult. we recorded (on the authority of a correspondent of the "Pall Mall Gazette") the invention, by Baron Auer von Welsbach, of a combination of cerium and iron of so highly sensitive a nature that the lightest touch will cause sparks to fly from it. For artillery and explosive purposes generally the invention is believed to have great importance. Much has been written on the subject of the catalytic effect of cerium; but this discovery surpasses all expectations. It is, of course, closely connected with incandescent gas lighting, and therefore is of interest to those who are engaged in the industry. Monazite sand contains from 40 to 50 per cent. of cerite earths, and only from 4 to 5 per cent. of thorium. Mantles for use in incandescent gas lighting require 99 per cent. of thorium oxide and 1 per cent. of cerium oxide. Considering the large quantity of thorium used annually in the production of mantles, it will be readily understood that a great deal of cerium goes to waste. Several proposals have been made to utilize it; but nothing definite has been arrived at. The cerite earths contain, besides cerium, lanthanum, neodymium, praseodymium, and traces of other rare earths; and therefore these have to be separated from it. This operation is one of the chemist's most difficult tasks. Of all the rare earths, cerium occupies a singular position, inasmuch as it has two grades of oxidation while it possesses different properties. All processes which serve for the separation of cerium are based on its transmission—the fourth grade of oxidation. This matter was recently brought before the Chemical Society by Signor Mario Esposito, as mentioned in the "JOURNAL" for the 26th ult. (p. 797). He stated that oxidation with permanganate of potash, according to Drossbach, and Böhm's method, is probably the most rapid and the most satisfactory way of obtaining almost pure cerium. In a treatise recently published by Meyer and Schweitzer, the permanganate of potash process is placed on a scientific basis; and it is an improvement upon the existing method. Consequently, by treating the cerite earths with the permanganate and a certain quantity of soda, pure cerium can be obtained by a single operation.

**Effect of the San Francisco Earthquake on the Lighting Plant.**—The part of the "Proceedings" of the American Society of Civil Engineers for the past month contains a number of reports by a General Committee and six Special Committees of the San Francisco Association of members of the Society on the effects on engineering constructions of the earthquake which occurred there on the 18th of April last year. The report in regard to local transportation and lighting plants contains only the following sentences bearing upon the latter: "Immediately after the earthquake, all gas was shut off the city lines; but sufficient was in the mains to cause numerous explosions as the fire progressed. With the exception of the North Beach plant, the various gas-works were uninjured. The damage to mains was principally due to explosions. As service was gradually restored, it was found that the house-pipes, except in very few instances, were not damaged. The electric lighting plant of the San Francisco Gas and Electric Company suffered very little injury by the earthquake; but the fire destroyed all the distributing sub-stations, and played havoc with overhead distributing lines. The underground conduit system and the Edison tubing came through both earthquake and fire in very good shape."

# ILLUMINATING TRUTHS FOR HOUSEHOLDERS.
## (1)

### THE SANITARY ASPECTS OF GAS AND ELECTRIC LIGHTING.

**NOTE: Under the above heading, a series of articles, written in a style suitable for general distribution among householders, will be published in the "Journal" during the next few weeks. Pamphlets are being freely distributed by electrical competitors containing so many untruths detrimental to the use of gas, that it is necessary to combat them; and one of the best ways of doing this is to quote as far as possible from disinterested, authoritative sources. In the articles, we shall, of course, draw from matter that has already been published in the "Journal;" but in the collected form in which that and the fresh matter will now be presented, it will, we hope, be useful. The articles will be separately reprinted by us, in a form suitable for periodical distribution by gas suppliers. In this way, a fresh and distinct subject will be introduced to householders at each distribution.**

In dealing with the question of the deterioration of the atmosphere by artificial illuminants, electricians conveniently forget three things:

(1) That, without mechanical ventilating aid, the atmosphere of a tenanted room in which electricity is used will become stagnant and oppressive.

(2) That the use of gas in a room creates an updraft, which, by the aid of the simplest ventilating outlet, will cause constant renewal of the air.

(3) That whereas six good flat-flame burners, consuming 5 cubic feet per hour each, were formerly—in the old wasteful days of gas lighting—required to give a light in a room of 60-candle power, 3 cubic feet of gas will now give that illuminating value by being used in a burner fitted with an incandescent mantle.

That is to say, in pre-incandescent gas-burner days, ten times more gas had to be used to secure the same illuminating power as can be obtained by the present scientific means of utilizing gas for rendering light. It is easy for anyone to imagine the enormous difference that such a great drop in the consumption of gas in a room has made. Then, too, it was common for the gas burned and the open flames to be subject respectively to the most crude regulation and to draughts—in fact, it was next to impossible to ensure anything like what might be truthfully called perfect combustion.

Notwithstanding the large amount of gas then burned, compared with the modest amount now required, there were not great complaints in those days as to vitiation ("poisoning" is the impressive term used by electricians nowadays) of the atmosphere; nor, so far as we are aware, has there been any shortening of our own lives, or was there of those of our predecessors. Now we burn much less gas; but, in their eagerness to secure custom, electricians, in their advertising literature, imagine many strange things, and endeavour to frighten the credulous householder into giving them his lighting business. It is sheer nonsense, in these times of incandescent gas lighting—when burners are intelligently used—to talk of the small amount of gas consumed doing this and that damage, and causing ills that in other days when more gas was used in rooms were unheard of. There is before us as we write one pamphlet which alleges that "gas robs the atmosphere of its life-sustaining oxygen, and imparts to it various more or less harmful gases; and the effect of these gases upon the health of those breathing them cannot be over-estimated." The wonder is that, considering the amount of gas that is used, the civilized races have not become almost extinct.

Unwary householders who, by vapid talk of the kind to which reference has been made, have been trapped into giving electricity their custom, have found out to their cost that just as "all is not gold that glitters," so all is not truth that appears in pamphlets circulated by electricity suppliers. When the heavy expense of the electricity installation has been paid for, the bills for electricity and new lamps at the end of the year settled, when the inconvenience of failures of the light has been borne with all the meekness and all the fortitude that can be commanded, when the family have grumbled unceasingly through the twelve months at the economy of illumination afforded by the joint efforts of variable current voltages, electric lamps declining in illuminating power, and of paterfamilias (in the cause of retrenchment), and when the members of the family have appeared no better in health through that period than formerly, then paterfamilias has to reluctantly come to the conclusion that he has been grossly beguiled.

#### The Opinions of Scientific Men and Papers.

Let us see what scientific men and others who have no interest in taking the part of gas any more than that of the electric light have to tell us on this subject of gas vitiating the atmosphere, and producing all the newly discovered ills of which electricians speak. The evidence of independent scientists will have greater weight with the householder than any amount of naked and unsubstantiated assertion on the part of gas engineers or electricians.

#### Carbonic Acid.

Professor Percy F. Frankland, F.R.S., of the Birmingham University, in 1902, was asked to report on the lighting of the Birmingham Art Gallery. The treasures and pictures there are of great value; and the important question that Professor Frankland had to advise upon (this threw a great responsibility upon him) was that of the best system of lighting for the preservation of the treasures and pictures. The question was gone into most thoroughly by him; and his evidence is indisputable that incandescent gas lighting, with ventilation, is far more conducive to pure and healthy surroundings than electric lighting. The report that he made on the subject is a long one; but he summarizes the results of his researches as follows:

> These experiments clearly show that under the conditions of ventilation prevailing at the time—
>
> (*a*) In the absence of any artificial illumination, there is a slight increase in the percentage of carbonic acid in the air of the gallery during the course of the day.
>
> (*b*) With the electric arc lamp illumination, the increase in the percentage of carbonic acid is distinctly more marked.
>
> (*c*) With the incandescent gas illumination, on the other hand, instead of there being any increase, there is a distinct diminution in the percentage of carbonic acid in the air.

Now Professor Frankland has neither gas nor electricity to sell; and the position he occupies in the scientific world must ensure the acceptance of his views as authoritative.

Commenting upon his report, the "Birmingham Daily Gazette" (which is also quite disinterested) said on July 22, 1902:

> The results of Professor Percy F. Frankland's experiments in the large room of the Art gallery, with a view of ascertaining whether the artificial illumination by electric arc lamps or by the incandescent gas installation respectively is preferable from the point of view of possible damage to pictures, have been embodied in a lengthy report, which was presented on Monday to the Museum and School of Art Committee. As we stated some time ago, the Professor finds in favour of gas. The fact that the percentage of carbonic acid actually diminishes during the use of the incandescent gas-burners, conclusively proves to his mind that the products of combustion, from which damage to the pictures might be apprehended, are completely carried off by the ventilation, which is so much promoted by these burners. He expresses the opinion, therefore, that the incandescent gas installation at present provided is to be preferred to the arc lamps, which are much less effective in promoting ventilation; and although these lamps do not give rise to sulphur compounds, they do generate ozone and oxides of nitrogen, which are calculated to act prejudicially on pictures.

Mr. (now Sir) Henry Burdett, in "Helps to Health," says:

> Nine hundred and ninety-nine people of a thousand believe that the ordinary impurities of air in inhabited rooms are due to carbonic acid gas, and that to provide against this impurity is to secure an adequate and healthful supply of air. As Dr. Billings has humorously declared, the average ventilating enthusiast holds this as the dogma of true ventilation; in his papers on the subject, he will enlarge on the deadly nature of this subtle poison. . . . Carbonic acid gas in the proportion in which it is met with in the worst ventilated rooms, is not in itself a dangerous or even an injurious impurity.

Dr. Whitelegge, in "Public Hygiene," remarks:

> Where this gas is present in excess, it is important merely as an index of the amount of injurious organic impurity contributed by human exhalations.

The "Lancet," as the result of investigations a few years ago, said that—

> Any carbon dioxide resulting from the combustion of coal gas is quite insignificant compared with that exhaled by the human individual. Of the two, the human exhalation is much the more prejudicial to health.

A special Analytical and Sanitary Commission of the "Lancet," in investigating the incandescent burner further reported—

(1) The heat and carbonic acid produced by the combustion of this burner is only one-half that of an ordinary gas-burner; though the light given is more than three times as great. [Six times as great is nearer the truth.]

(2) The heat and carbonic acid produced is less even than that of the ordinary oil-lamp.

(3) There is not a trace of any poisonous gases—such as carbon monoxide or acetylene—in the products of combustion.

Some time ago, Professor Frank Clowes, Chief Chemist to the London County Council, read a paper before the Society of Chemical Industry at Nottingham, on the atmosphere of the Central London Railway. In the course of it, he said:

> It will be understood that, owing to the absence of combustion in the locomotives and in the illumination, the pollution of the atmosphere is almost wholly due to the respiration and to the excretion from the surface of the skin of the passengers and staff. Hence the increase in the carbon dioxide may be considered to imply an increase of organic matter excreted from the human body, and must be considered to be more pernicious to health than that which arises in the tunnels of other underground lines from the working of steam locomotives and illumination by gas.

Looking back in the "British Medical Journal," Dr. W. A. Aikin is to be found writing as follows upon the change in the lighting of large halls and other places in which people assemble:

> The atmospheric conditions are now quite different; for the whole contamination is the effect of human exhalations. . . . Such air becomes unfit for respiration much earlier than when carbonic acid alone has to be considered, and the necessary air-change is certainly retarded by the absence of gas-burners.

We cannot omit from this collection of quotations from authorities, the opinion that Professor CARLTON LAMBERT, M.A., communicated to the "Hospital"—true, some time ago; but his remarks are, if anything, owing to the modern improvements in incandescent gas lighting, even more applicable to-day than they were when written:

In the old days of gas lighting, this air pollution was in ill-ventilated rooms a more serious matter; but now that we get the same light as formerly by burning only from one-sixth to one-tenth the amount of gas, this objection to gas lighting has practically vanished.

A little calculation will make this clear. A room containing 3000 cubic feet is amply lighted by a single Welsbach. If the ventilation is as usually provided, the circulation through the flue and other outlets and inlets will cause the air contents of the room to be thoroughly changed at least three to four times per hour; the circulation being, in fact, assisted by a gas-burner through the differences of temperature which it sets up. Thus we may say that about 10,000 cubic feet of outside air enter the room hourly. Now a Welsbach burner, consuming 3 6 cubic feet of gas per hour, produces about 2 cubic feet of carbonic acid in the same time. After the lamp is lighted, the extra quantity of carbonic acid in the room, resulting from the gas, will gradually, in an hour or so, rise to its maximum, and *can never exceed 2 per* 10,000 *of air*. Now this is about half of what already exists in the mountain air of Ben Nevis, and may be altogether disregarded in its effect on health.

Of course, when it is said that an adult only expires 0·6 cubic foot of carbonic acid hourly, therefore a gas-burner is as bad as three or four adults, this is only true in the matter of the comparatively innocuous carbonic acid gas which they put forth. *It is the organic exhalations from human beings which are the real source of danger, and not the products of combustion of a good gas-burner.*

Professor VIVIAN B. LEWES, of the Royal Naval College, Greenwich, and many other authorities on this question, have said much the same thing. With these statements before one, what can be thought of electricians who persist in saying that incandescent gas-burners impart to the atmosphere more or less harmful gas, "chief among which is the injurious carbonic acid?"

**"Vital Oxygen."**

So injudicious and untrue are the statements circulated by electrical people about the vicious influences of gas lighting on the air of rooms, that the (London) Gaslight and Coke Company were forced to move in the matter of compelling the St. Pancras Borough Council to withdraw a most damaging statement in a pamphlet issued by them, entitled, "Electricity—Useful Hints." The untrue statement was this:

One ordinary gas-burner consumes the same amount of vital oxygen as five people. Putting it in another way, an ordinary gas-flame will render poisonous the atmosphere in a room 12 ft. by 14 ft. by 11 ft. in six minutes.

The Gas Company sent a communication to the Council, informing them that, unless this statement was withdrawn, they would have to consider the taking of further steps in the matter. The Council believing that "discretion was the better part of valour" withdrew the pamphlet, but declined to express an opinion as to whether or not the objectionable statement was inaccurate. The withdrawal was an admission that the Council were uncertain whether or not the statement was true, and therefore could not defend it. Yet they had been guilty of circulating it—no matter to them whether true or untrue—with the one view of inducing the uninitiated to believe it, and so to endeavour to turn them from economical gas to dearer electricity.

There is before us another pamphlet circulated by an Electricity Company, in which the statement is made that an "average gas-burner consumes as much oxygen as four or five human beings." That is the very point on which the Gaslight and Coke Company were prepared to enter into a contest—even to litigation—to establish the untruth.

**A Doctor and Sulphuretted Hydrogen.**

Then a statement by Dr. GEORGE CARPENTER, M.D., is quoted by electricians, in which statement he says that gas, in burning, gives off quantities of carbonic acid and sulphuretted hydrogen. As to the carbonic acid question, there is all the foregoing quoted authorization for saying that Dr. Carpenter is wrong; and as to sulphuretted hydrogen, he may be challenged with equal impunity on that point. Every schoolboy who has a smattering of chemical knowledge has some notion as to what sulphuretted hydrogen smells like; and that smell is never to be detected in gas-lighted rooms. Dr. Carpenter's knowledge was seriously at fault when he made that statement. It is ordained by the Gas-Works Clauses Act, 1871, that—

Gas shall as to its purity not exhibit any trace of sulphuretted hydrogen when tested in accordance with the rules prescribed.

And what Parliament has ordained in that regard is faithfully complied with by gas companies and the committees of gas-supplying local authorities. Sulphuretted hydrogen, as a matter of fact, is one of the simplest impurities of crude gas to remove; and it can only be by some purely accidental circumstance, that sulphuretted hydrogen escapes with the gas sent out into the distribution system. The result is that the returns of gas-testings for which provision is made by Act of Parliament invariably contain in the column headed "Sulphuretted Hydrogen," the word *nil*.

**Sulphur in the Air.**

There is further important testimony regarding the sulphur question. By instruction of the South Metropolitan Gas Company, Mr. OTTO HEHNER and Dr. SAMUEL RIDEAL carried out some extensive investigations into the subject of the vitiation of air by sulphur compounds; and, in the course of their researches, they contrasted the sulphur content of outside air with that in rooms containing products of the combustion of gas. The researches produced voluminous reports, which, through the technicalities involved, would not be of general interest. But this is one of many of the declarations made as the result of the careful and scientifically conducted inquiry—

In an ordinary papered and whitewashed room, the sulphur oxides thrown into the air by the combustion of a gas-flame were removed so rapidly that the proportion of sulphur in the air of the room was not materially greater, and even sometimes smaller, than the total sulphur-content of the outside air.

The higher sulphur content of the outside air is due to the emanations of countless domestic chimneys and shafts of manufactories, among the latter of which may be included those of electricity generating stations.

It is inconceivable that electricity suppliers, if they are honest, will be parties to the continued publication of untruths that it is so easy to demonstrate are such.

**Stale Air and the "Influenza Microbe."**

"Medical men have asserted that the vitiated air of theatres encourages the influenza microbe." These words are extracted from an article published in the "DAILY TELEGRAPH," in December, 1906. From an editorial in the same issue, these sentences are taken:

The substitution of electric light for gas, which burnt up the atmosphere, worked marvels in itself; but the full benefit of the change has not been reaped by theatre-goers, who still have to brave the perils of chills, and occasionally the miasma of stale and used-up air.

Returning to the first article, it is seen that—

Long ago it was discovered that a cluster of lights in the centre of a ceiling is an excellent medium of ventilation by the drawing up of vitiated air. Accordingly they are largely adopted in theatres, and have special flues above them, through which the bad air passes to the open.

Earlier in the same article, it is found that—

One fact is demonstrated—that a habitually closed room becomes a nursery of micro-organisms, which are by no means distressed by an occasional flushing of fresh air. On the other hand, a room which is habitually well ventilated is greatly disliked by these troublesome minutiæ; and they will avoid it on principle.

Now piecing these facts together in this way, we have presented to us certain truths, which will apply equally to rooms and halls as to theatres where electricity is employed. In the first place, we have the information that vitiated air in theatres encourages the influenza microbe, and that the theatre-goer has to occasionally face a miasma of stale and used-up air. Yet the electric light has been substituted for gas! There is a little fallacy about the burning-up of the atmosphere by gas, seeing that "long ago it was discovered that a cluster of gas-lights in the centre of a ceiling is an excellent medium of ventilation," &c. The authorities already quoted point to the rapid renewal of the air in places where gas lighting is used. Hot air, by the natural order of things, ascends; and if there is a means of escape, it will do so, carrying all noxious air with it, and giving place to fresh air. Thus the up-current produced by gas-lights is very beneficial in ventilation. Were there no ventilation, and were it true that gas-lights (we have now the economical gas-consuming incandescent light) "burnt up" the atmosphere, these influenza microbes which appear to be very particular about their habitations, would suffer cremation before they could do any harm. And as they will avoid on principle well-ventilated places, and gas is an excellent ventilator, there can be nothing so useful as gas for the protection of the public against these distress-provoking pests. In ordinary rooms, the householder cannot very well have the buzzing and more or less effectual electrically worked ventilators (which assist to draw into rooms the products of combustion from open fires); and therefore, with heavy atmospherical conditions outside, he may depend upon producing in electric-lighted rooms those comfortable quarters that are favoured by the influenza germ.

**Householders Left to Judge.**

Between the evidence of scientists (without electricity to sell) and the assertions and imaginings of electricians (with electricity to sell), householders may be left to judge—

(1) As to the truthfulness of the statements of electricians; and

(2) As to the relative sanitary effects of the two forms of artificial illumination—gas and electricity.

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Reference has been made in previous issues of the "JOURNAL" to the excellent advertising methods of the Consolidated Gas Company of New York. We have just received from Mr. W. J. Clark, the Superintendent of the General Fuel Appliance Department of the Company, a set of twelve post-cards which their canvassers will use this season, accompanied by a leaflet entitled a "Bulletin to Consumers," presenting in a small compass a solution of the servant problem in the better class of private dwellings. The cards are some of the best things of the kind we have seen for the advocacy of gas as a culinary, heating, and labour-saving agent.

## INCLINED RETORT-HOUSE EQUIPMENT AT STOCKPORT.

Two of the photographs to illustrate the first article on the new inclined retort equipment at the Stockport Corporation Gas-Works came to hand too late for inclusion when publishing the article a fortnight since; but as there are points about them of particular interest, which supplement the information already published about the settings, we reproduce them this week.

In the first illustration, we have a view of one of the regenerator chambers, wherein the waste gases travel downwards on either side of the secondary-air passage, which is centrally situated. It is interesting to note that the baffle-tiles are rebated on the top and underside, so as to prevent short-circuiting. The division walls are built with bricks on edge, arranged to break-joint. The flue and damper boxes are of cast iron, and of a very handy size; being 9 in. by 3 in. and 12 in. by 6 in. respectively—thus giving plenty of space to regulate the dampers, or to remove any obstructions to the waste-gas flues.

Fig. 2 is a view at the flame-bed level. Looking at the furnace arch in the centre, two openings will be noticed at the back. These are the furnace-gas outlets—one for the right hand, and one for the left hand. The main arches are divided in the centre, making really two settings to one furnace. The furnace gases turn to the right and left respectively, then come towards the observer, and are distributed through nostrils in the small arches. The secondary air comes in from one half of the smaller gothic arch, situate at the extreme right and left of the setting; the waste gases occupying the remainder. The dividing wall of the secondary air from the waste-gas downtakes is built so as to break-joint in all directions.

One important feature is the central buckstave which has had to be specially treated, so as to enable the furnace feeding-frame and door to be fixed. The centre buckstave is 12 in. by 6 in. H section, with legs of the same section attached to the main body by plates, cleats, &c.; the distance inside the arms being just sufficient to hold the furnace feeding-frame.

It will be noticed that the whole of the work in connection with the setting can be entirely depleted without disturbing the furnace or regenerator in any way. On the other hand, the furnace and regenerator can be dealt with in the same manner, without in any way disturbing the setting.

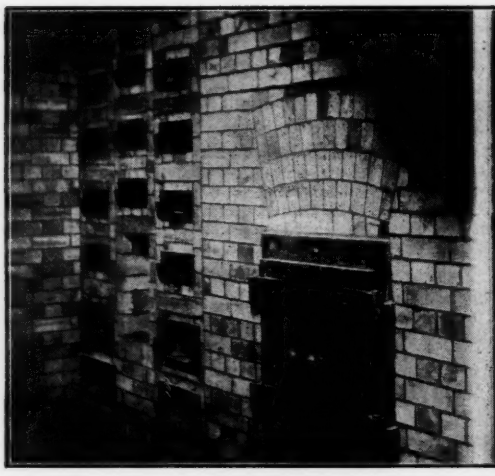


Fig. 1.—View of the Regenerator Chamber.

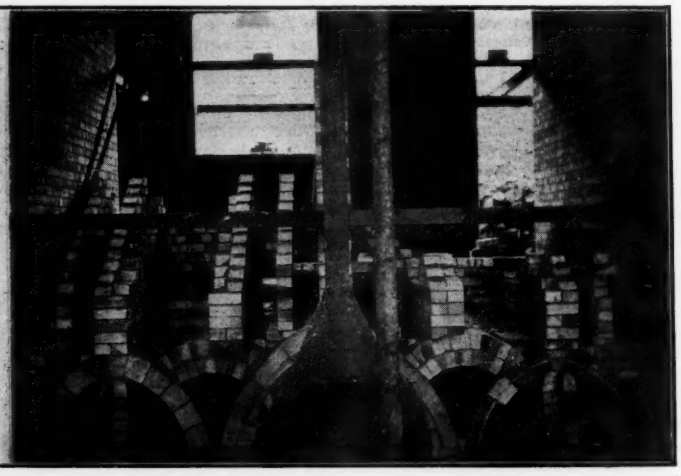


Fig. 2.—View of the Flame-Bed Level.

## USE OF TAR IN ROAD CONSTRUCTION.

At a Conference of Municipal Engineers, held on Friday in the Surveyors' Section of the Building Trades Exhibition at Olympia, under the presidency of Sir JOHN WOLFE-BARRY, K.C.B., &c., the following paper on the above subject was read by Mr. A. DRYLAND, Assoc.M.Inst.C.E., County Surveyor of Wiltshire.

Modern developments of traffic by self-propelled vehicles, deriving their propulsion from wheel friction with the road surface, have led to an immense increase in the use of tar, in various forms of application, to prevent the disturbing effects of this frictional wear, and, incidentally, the raising and distribution of the dust particles present on all macadamized roads as commonly formed. The larger proportion of this dust is due to foreign matter either blown or deposited upon the highways, and to excess of binding material; but a considerable amount is caused by the wear due to common forms of traffic. There is no doubt that increased abrasion of the surface, and consequently more dust, is the result of the wheel friction propulsion before referred to; and fast-moving vehicles of this kind, as at present constructed, form most efficient dust raisers and distributors. It will be contended, no doubt, that horse-drawn vehicles are propelled by friction, by means of horses' hoofs. This is perfectly true; but it was so distributed and minimized by the muscular form of application that the dust trouble, previous to the increase of self-moving vehicles, was not of sufficient importance to cause any particular anxiety to the road engineer.

The "wear and tear" and "dust" problems are now the important questions, troubling not only the road engineer, but all users of, and residents near, our important thoroughfares. The solving of these problems does not rest entirely, or even chiefly, with the road engineer, because there must always be a considerable quantity of dust upon roads from other sources than wear; and motor engineers could, and should, do much by improvements in design to lessen the dust-raising powers of the modern motor-car. But the devising of some reasonably perfect form of road surface, obtainable at a modest cost, would confer an immense immediate benefit upon the whole community.

The ideal road surface for such a purpose would seem to be one smooth and firm, yet slightly elastic to give a good foothold, composed of materials sufficiently strong to give off the smallest quantity of dust by abrasion. The attempts at providing such a *desideratum* have been largely confined so far to the application of tar, mostly in the following ways: (1) Tar concrete, (2) tar grouting, and (3) tar painting and spraying. I will deal shortly with these under their respective heads.

### TAR CONCRETE.

For many years tar concrete has been used for roads; but until recently it has been principally confined to providing surfaces for highways of light traffic in towns. The author, more than twenty years ago, converted several miles of boulder-paved narrow streets in a seaside town to tar-macadam roads composed of broken flints from the seashore and burnt shingle obtained from the same source. Though the materials were by no means ideal, the purpose of providing a clean and comparatively noiseless roadway was served; and with annual surface dressings of tar and fine shingle, and small repairs, these roadways are still, he believes, good and efficient. In several seaside towns, tar concrete compounded of limestone has been in successful use for many years as a road material. More recently tarred slag has been largely employed, and with a considerable, although varying, degree of success. Experiments on a considerable scale have been made with basalts, granites, and quartzites as the aggregate for tar concrete. With some of these, there have been failures. It has always appeared to the author that the adhesion of the tar to the aggregate was the secret of success in tar concrete. A good deal has been said and written about the "impregnation" of the material forming the aggregate by the tar. The author would like to elicit opinions as to this impregnation; his personal view being that a material that is sufficiently porous to absorb gas tar to any considerable extent is not of a sufficiently durable character to withstand any considerable traffic. The author's view is that the principal requirement is a hard material which breaks with a sufficiently rough surface to form a good adherence for tar. Many of the hardest and finest grained road materials are, in the author's opinion, unsuitable because of the clean, smooth surfaces left by fracture.

As to the preparation and laying of the concrete, the following are, in the author's view, essential points.

1.—An aggregate of the character before suggested, free from dirt or dust, with all moisture expelled by artificial heat.
2.—Well-boiled gas tar—that known as "distilled tar" being preferable—applied to the heated aggregate at a temperature closely approaching boiling-point.
3.—The thorough admixture of the ingredients in such proportions as will ensure the coating of every particle without an excess of tar; the quantity needed varying with the kind of material and the gauge.
4.—The ripening of the material, previous to laying, for a period of four to eight weeks in bulk.
5.—A firm and true foundation.
6.—A coarse aggregate for bottoming, not less than 2½-inch gauge, and topping not smaller than 1½ inches for roads having any considerable traffic, with a total thickness of 4 inches at least.
7.—The material should be laid on a dry surface, be thoroughly rolled, and receive a top dressing of a small amount of clean stone or slag grit.

Varying success has attended the use of tar concrete; but the author thinks that when it has not been successful, this has been due to want of attention to some of the above-mentioned details or to bad weather interfering with the work when in process of laying. There are, no doubt, limits to the ability of the best tar concrete to withstand traffic, just as there are to the best ordinary macadam. In the author's opinion, it is more likely to be a success on open roads than in damp or perpetually shaded situations; excess of moisture being deleterious to the life of the tar.

### TAR GROUTING.

By this the author means the use of tar in some form in place of the usual slurrying of ordinary macadam roads. It has been used with considerable success, especially when followed shortly after by a surface dressing of tar and grit. It is of the utmost importance that the whole operation of laying the macadam and the grouting should be performed in dry, warm weather, when both the road and the material are perfectly dry; and the metal should be firmly consolidated before the tar is applied. The author has seen successful results obtained by this method with a top dressing of clean ¼-inch basalt chippings. Under this head, reference might be made to the system of spreading the metal upon a layer of fine and rather moist tar concrete, and rolling until this is forced upwards as a grouting. The author has not seen this carried out; but he sees no reason why it should not meet with considerable success, especially if followed by a top dressing.

### TAR PAINTING AND SPRAYING.

For both of these operations a very dry road is essential, and hot weather a great advantage. Moisture in the road surface will prevent proper adhesion of the tar. A newly-coated road surface is also necessary to any considerable measure of success. When once the surface has become worn and compacted, the tar cannot penetrate sufficiently, and a thin film only is formed, which is destroyed by wet or frost.

Another most important matter is the thorough removal of dust from the surface and between the stones, to permit a sufficient key. All those who have had much experience in the application of tar know that it refuses to penetrate fine, dry dust, and will realize the importance of thorough brushing. It has occurred to the author that if a suction process, similar to that in use in the "pneumatic cleaner," could immediately precede the application of the tar, it would be advantageous. Perhaps some of the designers of tar-spraying machines may develop this in some practical form. The deeper the penetration of the tar, the nearer the success of the process of tar painting or spraying will approach tar macadam; and removal of dust to a good depth is essential to penetration. Attempts at injection by force will, in the author's opinion, fail unless the dust is thoroughly removed.

Within the limits of so short a paper, it is impossible to deal fully with all the points and processes which have been tried with more or less success. The author therefore desires to call attention to certain points with the view of eliciting discussion; and he would suggest particularly as worthy of consideration the following: (1) The suitability of tar macadam for heavy traffic, and the best kind of aggregate to withstand it. (2) The size of aggregate and the thickness required. (3) The best top dressing. (4) Tar grouting, and the increase of life of a macadam road thereby. (5) The best means of tar painting or spraying, and the preparation of the road surfaces for the same. (6) Reliable figures as to the cost of carrying out the different processes. (7) The life of roads treated by any of these means as compared with that of ordinary macadamized roads laid with high-class materials in the best possible manner. (8) Experiences as to disintegration of tar-treated roads, and the cause.

## EXPERIMENTS IN BIRMINGHAM.

A number of experiments were made in Birmingham last year with tar, with the object of minimizing the dust nuisance. The surface of a road in Edgbaston was painted by hand; while other suburban roads were sprayed. The result of the latter experiment was so satisfactory that the Public Works Committee of the Corporation have decided to extend the principle this spring. Mr. Stilgoe, the City Surveyor, has been authorized to expend a substantial sum; and it is not unlikely that twenty or more of the chief suburban roads will shortly be sprayed. Interviewed a few days ago by the representative of a local paper, Mr. Stilgoe stated that he was well satisfied with the durability of the tar-spraying. During the whole of last summer, the road treated did not require the use of the water-cart; while in the winter the mud was reduced by something like 50 per cent. He said the spraying could be carried out at a cost not exceeding ¾d. per square yard; and though the outlay seemed large when compared with that of the repeated use of water, he believed that in the long run it would prove more economical. "If a coat of tar does not wear away," he added, "from April to October, there must be preservation of the road surface. The only question that remains to be decided is how the spraying will withstand the winter." Another experiment which is being made in Birmingham is to use tar instead of water in making the surface layer of a macadam road. The hope is entertained that the consolidation of the material will prove more satisfactory, and that the effect of the tar coating of the stones will be to obviate the use of the binding material which is now employed to keep the stones together. Asked how far tar-spraying was practicable on the main roads in the rural districts, Mr. Stilgoe stated that it was admittedly a rather costly process; but the effect was to substantially reduce the amount of dust. The results in the South of England were very marked when comparison was made with the country roads of the Midlands.

## A ROAD-TARRING EXPERIMENT AT SOUTH HAVEN (MICH.).

According to an article in "Engineering Record," macadam and clay roads have been successfully treated with unrefined gas tar at South Haven (Mich). The macadam street where the experiment was tried had been newly surfaced with limestone macadam upon which no traffic had been permitted, and which was allowed to dry ten days before the tar was applied. The tar was heated in a 150-gallon roofer's tar-kettle, and was spread with 14-quart sprinkling cans made by fitting to an ordinary garden sprinkler a special spout, which, when the can was in use, gave a horizontal opening about 6 inches long and ⅛ inch wide. The kettle was set up in the middle of the block to be treated, and two barrels of tar were put in it and brought to the boiling-point. Six sprinklers were then filled, and two of them were carried by each of three men. Each man poured with a sweeping motion from side to side, and covered about one-third of the width of the 50-feet macadamized surface; thus carrying a straight face of tar up the street. Closely following the sprinklers was a man with a fibre broom, who smoothed out the thick spots, and rubbed in the tar wherever dust or depressions prevented good contact. Immediately following came two men, who with scoops covered the tar with a ½ inch to ¾ inch layer of limestone screenings. After this the street was rolled at once with a 10-ton steam-roller, and subsequently opened to traffic.

The gang which did the work was organized as follows: One kettleman, who acted as foreman, two barrelmen, and three spreaders, each at 22½ c. per hour; one broomer and two surfacemen, at 17½ c. per hour; one team hauling tar, wood, and screenings and moving the kettle, at $3·50 per day of ten hours. The cost of treating 16,620 square yards of old street was as follows: 7750 gallons of tar, at 3 c., $232·50; labour, $247·86; 292 cubic yards of screenings, at 90 c., $262·80—total, $743·16, or nearly 4½ c. (2¼d.) per square yard. The cost per square yard for labour was 1½ c.; and the quantities of material required per square yard were: Tar, 0·466 gallon; screenings, 0·175 cubic yard. These costs include the cleaning of the street surface, which was done with steel brooms and hoes. In addition, the city roller was used for about 15 hours. With a portable kettle, Mr. Wightman believes that a saving of 20 per cent. would have been effected, by doing away with the time lost by all hands when the fire was put out and the tar drawn off and the kettle moved.

The effect of the tar on macadam streets was so pleasing that it was decided to experiment on clay. Accordingly, a porous, yellow clay street, having a width of 40 feet between the wood kerbs, was shaped up with a road grader, making a crown of about 20 inches, and rolled with the 10-ton steam-roller. Tar and screenings were applied in the same manner as on the macadam streets; and the results, according to Mr. Wightman, have been surprisingly good. In two or three places where light uncompacted dust was on the surface, the tar and stone covering has been broken. Otherwise it is in good condition, shedding the water nicely; and it bids fair to be a good, hard road for some time. The cost of the tar and stone was practically the same as on macadam. Before applying the tar, the road should be shaped and carefully smoothed by rolling and wetting until no loose or dry powdered clay remains; and—just the opposite to macadam, which must be perfectly dry—the clay should be slightly moist, as the hot tar on dry powdered clay rolls up into minute balls, and does not spread out as it should do in a film or sheet. In every instance, the tar should be as near the boiling-point as possible when applied to the street.

## THE DUST-PREVENTION COMPETITIONS NEAR LONDON.

The Judges appointed by the Roads Improvement Association to conduct the competitions for the best means of treating roads with tar to render them dustless, have provisionally decided that the tests of the tar-spreading machines shall begin on Wednesday, the 22nd prox. The roads upon which it is proposed to carry out the tests are in Middlesex—between Hounslow and Staines—the Middlesex County Council and the Staines Rural District Council having consented to give the necessary facilities.

# LOADING AND CONVEYING PLANTS FOR USE IN GAS-WORKS.

By G. Dieterich,

Engineer-in-Chief to Adolf Bleichert and Co., of Leipzig-Gohlis.

(*Continued from p.* 155.)

## THE MARIENDORF GAS-WORKS TRANSPORT PLANT.

As already mentioned, the conveying plant of the Imperail Continental Gas Association serves to carry the gas coal from the ships arriving at the newly-erected port on the Teltow Canal to the coal-stacking yards in front of the retort-houses. It is also intended to convey the coal from the stack yards to the retort-houses, and, if necessary, from the ships direct to the retort-houses. The capacity of the plant is calculated, when finally completed, for the conveyance of 600 tons of coal per hour. The first section, which is already working, consists, for the present, of only one-third of the projected scheme.

The general arrangement can be easily seen in the accompanying illustration (fig. 1). On both sides of the port, lengthwise, travelling ship-unloading cranes are provided, running on rails. These hoist the coal from the barges by means of two grabs, acting independently of one another, which empty their contents into hoppers placed within the framework of the crane. Before the hoppers of each crane is placed a suspended siding, connected with a fixed suspension railway by means of tongued rails. This siding is likewise fitted in the framework of the crane, and travels with it. From these suspended railways three are provided, acting independently, and each being in connection with two loading-cranes at the port—see fig. 2.

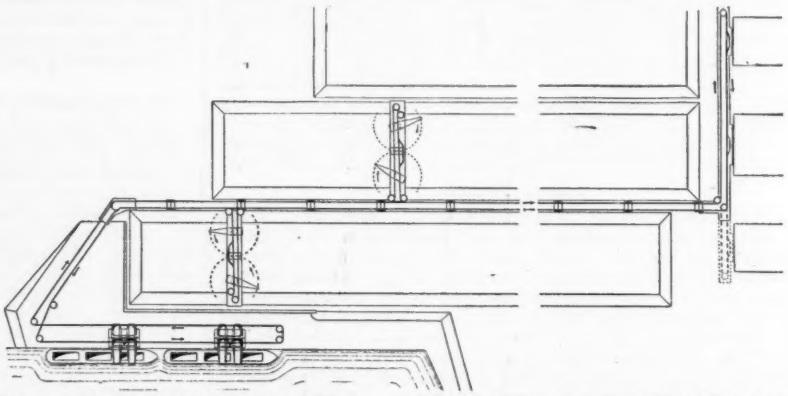


Fig. 1.—Sketch Plan of the Harbour, Coal-Stores, and Retort-Houses at the Marlendorf Gas-Works.

From the port, each of these three railways leads to a turning station, which is at the same time the driving station. Here the rails are at a height of 10 metres above the quay level, and the railways have therefore an upward gradient from the port railway No. 1 direct from the quay, and No. 2 and No. 3 not until the last section before the turning station, up to which point they run horizontally. From the turning station the railway runs horizontally over a double track between two coal-stacking sites to the retort-houses. Here they turn into branch lines, of which each has dumping stations and three retort-houses. The track level of this suspension railway is 10 metres above the ground. Travelling bridges, furnished with suspension rails, are joined on to both sides of the above-mentioned tracks. These rails are again connected by automatic lever switches to the fixed suspension rails of the tracks. On the other hand, the traction rope driven from the turning station is carried over this bridge by return sheaves arranged upon it, so that an uninterrupted mechanical working of the fixed suspension railways over and beyond the bridge is made possible, and each stacking yard can be stocked with coal over its whole length and breadth. For taking up the coal again, each travelling bridge is supplied with two rotary cranes, which lift the coal by automatic grabs from the yards, and empty it into loading hoppers. By means of a suitable locking contrivance, the ropeway cars running to the retort-house can be filled from these hoppers.

The loading crane at the port (shown in figs. 3 and 4) is calculated for an hourly capacity of 100 tons, for which each of the two grabs delivering 50 tons must make from 25 to 30 hoistings per hour. The contents of the grabs shown in fig. 5 amount to 3 cubic metres when worked in a full shipload of coal. As these grabs are also used for the rotary cranes in the stacking yard, it may be well to devote a little space to some more exact description of them. They are built on the two-rope system, so that they can be opened or shut at any desired height. This is effected in the following manner: The locking arrangement, consisting of a winch of the block-and-tackle description, is worked by means of a special rope, while the stopping of the grab at the required height for emptying it is effected by a second rope. Both ropes are coiled on special drums in detachable connection with one another. By this method of building, it is possible for the crane driver to tip the load as desired without being bound to any special height by possible locking appliances. The grabs are provided with heavy overlapping teeth, as only by their use is it possible for them to penetrate into the coarse coal employed. The efficiency of an automatic grab is naturally affected by its own weight, so that it is evident that appliances of such size and capacity must have a correspondingly high dead-weight. With this co-operating medium, the grabbing power is so strengthened that blocks ½ cubic metre thick and nearly 1 metre long can be easily clutched and taken up with other coal.

The cranes working these grabs are of the gantry travelling type, with two rotary jibs and tracks for two trolleys. The crane driver has to control four distinct movements—the hoisting and lowering of the grab, the travel of the whole bridge, the running of the trolleys, and a short slewing movement of the jib. This movement ensures the independence of the grabs from the connecting frames running across the ship, and makes possible a change in their position over the ship without either the crane bridge moving or necessitating the towing of the ship. The weight of the grab in these port cranes is not counterbalanced, so that the capacity of the hoisting motor must be correspondingly increased. The power needed for each grab is about 100 H.P., the trolley-driving motors require about 5 H.P. each, the motor for slewing the jibs about 8 H.P., and the crane-driving motor about 12 H.P. Thus a total power of about 230 H.P. is necessary for a port crane.

The driving and hoisting appliances for the grabs are fixed

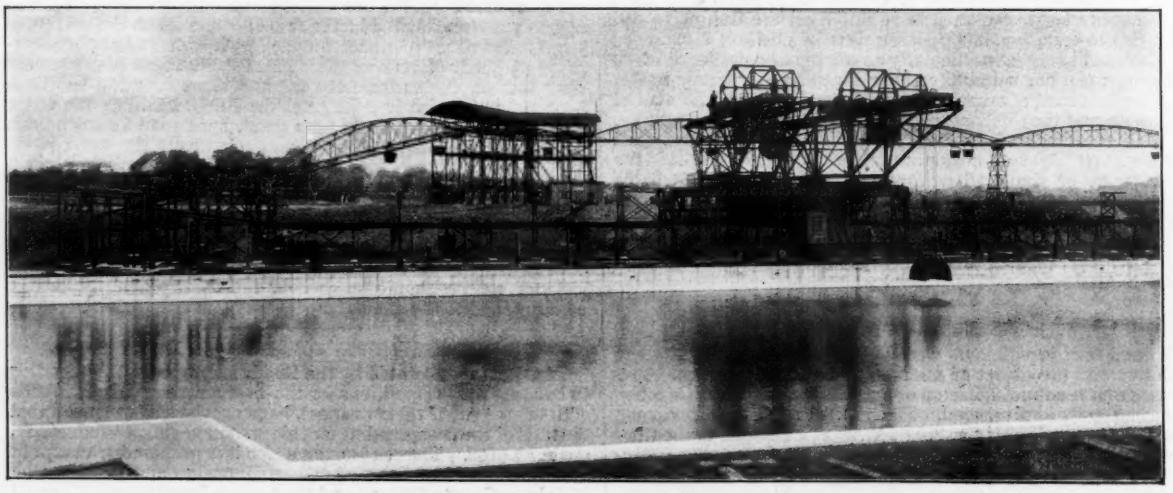
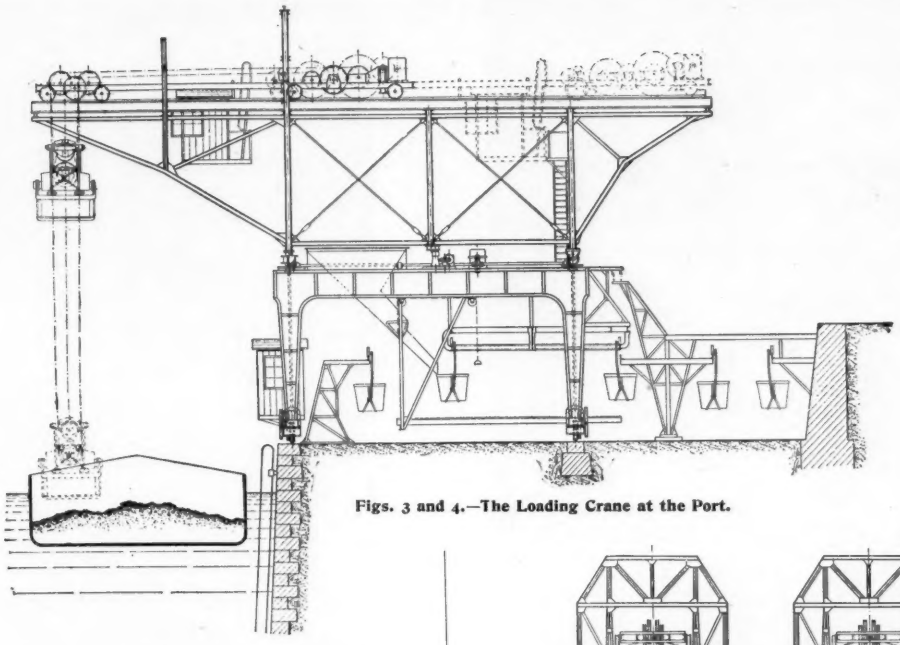


Fig. 2.—The Coal-Landing Arrangements on the Teltow Canal.



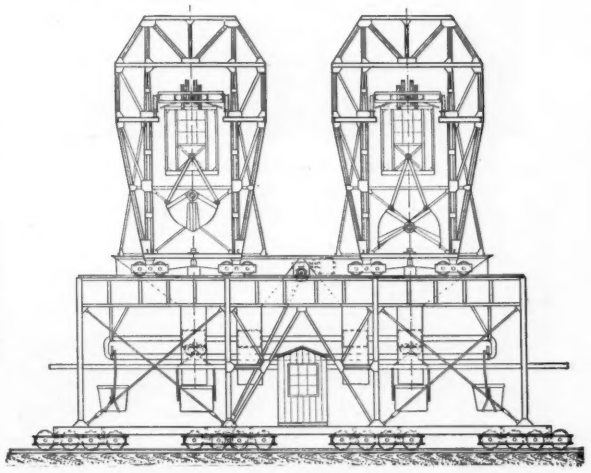
Figs. 3 and 4.—The Loading Crane at the Port.

to a trolley formed of a long right-angled frame, moving backwards and forwards on the crane tracks. This is so arranged that the carriage for the trolley and the hoisting winch for the grabs are fitted on the back part of the trolley, and the rollers for guiding the hoisting and carrying ropes on their drums are situated on the front part, above the grab. For the mechanic in attendance on the trolley, a travelling cabin is provided, from which he can comfortably overlook the working. In this cabin are also the electric switches for running the trolley and for hoisting. The current is brought through two wires along the trolley way. The movements of the whole bridge and the slewing motion of both jibs are effected from a special cabin fixed on the trolley bridge. The crane-travelling transmission is so arranged that more regular motion of the gantry supports is obtained, and swaying of the whole bridge is avoided by driving the horizontal transmission shaft by means of a motor situated in the middle of the crane bridge. The bridge travels on 32 wheels, fitted by fours in pendulum frames. The wheels in the two middle frames, which are subject to the greatest strain, are driven by the motors by slanting shafts and bevelled wheels through the horizontal transmission shaft. The travelling speed is about 10 metres per minute. On one side of the trolley is a covered platform with a wooden flooring and railings—offering an easy approach to the mechanical parts and lubricators.

As already mentioned, the grabs empty their contents into two hoppers, built in the iron construction of the crane. Each hopper is provided with two locking flaps, patented in Germany (No. 157,971), which allow of easy opening and closing with the heaviest loads, as also when really heavy blocks of coal are in question. The principle involved is that the material collected and to be dammed up must not be divided by slide or flap, but stopped in its natural gradient by a series of flaps which are let down successively, and gradually interrupt its free course. By this means not only is very easy working obtained, but the bulk of material is constantly within reach from outside, so that the heavier blocks can be kept back or be allowed to pass, and possible blockages easily removed by measures taken from without. (See fig. 6.)

The ropeway cars attached to the suspension switches, which are again connected with the gantry crane, are brought by the workmen before the locking flaps, loaded, and pushed on to an automatic weighing-machine (fig. 7) which weighs automatically, counting at the same time the cars which have run over its rails, and adding up the weights ascertained. A catch-bolt fixed to the machine prevents the cars from being either counted or weighed a second time; and as the whole mechanism is enclosed to a height of about 3 metres in a locked and plugged case, any tampering on the part of the workmen is out of the question. After weighing, the attendant pushes the car to the coupling-point, where it is taken up by the traction rope, which is in continual motion, and carried onwards. The car now runs on the first track section from the port to the driving station, about 180 metres distant, and 11·22 metres above the port suspension railway. Consequently, in this distance a gradient of about 6·1 per cent. has to be overcome.

At the driving station, as well as at the turning station, the portion of the ropeway which leads to the retort-houses joins on with a length of about 665 metres in its first section. The ropeway for the stacking yards runs by means of suspension rails under a number of parabolic bridge supports, having a span of about 40 metres each, except one, which has only 34 metres; so that this gives a total of 11 separate parabolic bridges from each turning station to the retort-house on the first ropeway. (See fig. 8.) The



suspension rails of special section on which the cars run have a height of 210 mm. on straight lengths, and 160 mm. at the curves, with a top breadth of about 30 mm., and lie outside the parabolic supports on projecting cross sleepers at the level of the under arch. When not carried by the cars, the traction rope runs on protection rollers fixed on the side jibs of the supports. The total weight of these bridges between the retort-houses and the angle station is about 156 tons 10 cwt.; and a gradient of 1·27 metres is distributed over the whole length of this straight section.

The hourly capacity of the plant at present working is 100 tons; but all constructions on the railway are so calculated that the

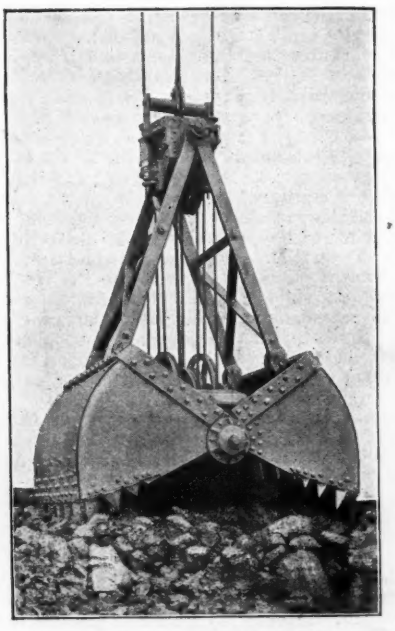


Fig. 5.—The Grab Used.

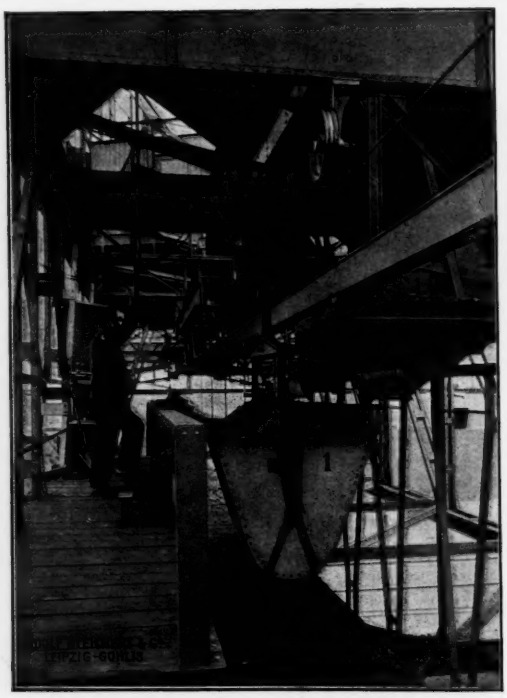


Fig. 6.—The Actuating Gear.

Fig. 7.—The Automatic Weighing Machine.

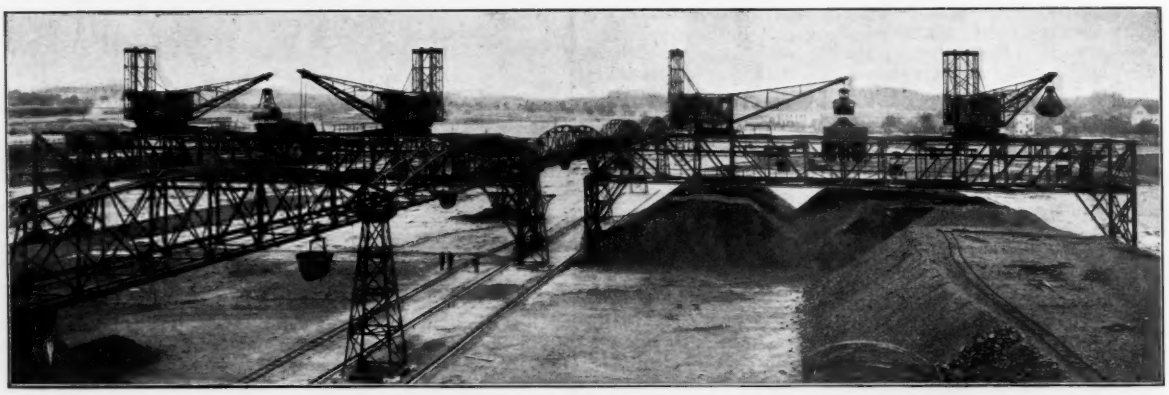


Fig. 8.—View of the Coal-Stacking Yards.

later capacity of 200 tons can be obtained without any further strengthening of the parts, by simply employing a greater number of cars. The capacity of these cars (fig. 9) is 1·5 cubic metres, or about 1200 kilos.; so that for the present output 85 cars hourly, or one car every 42·4 seconds, must be despatched. Conformably with this, the cars follow each other at distances of 34 metres with a velocity of 0·8 metre per second; whereas later on they will be carried about half the distance in half the time. The cars consist of sheet-steel receptacles, furnished with a locking arrangement for automatically emptying on the track. For coupling on the traction rope, the wheels are provided with the Bleichert patent "Automat" jaw-grip apparatus, which acts by the weight of the car. By this means, it is feasible for the cars to run over right and left curves; so that for passing the rail curves at the port and the retort-houses, as well as on the dumping bridges over the stacking yards, no attendance is required. The coupling and uncoupling of the apparatus is also perfectly automatic, as the car must grip the traction rope with absolute certainty as soon as the attendant has run it on to the point. By the use of this appliance, the working is quite independent of any attention by the employees—thereby considerably increasing the safety of working. Further, as the coupling and uncoupling of the appliance, even with quick-running traction ropes, is effected absolutely without jerk, the wear and tear of the jaw-grip and rope through coupling is practically *nil*.

The traction rope which keeps the ropeway in motion has a diameter of 18 mm., in view of the fact that the carriage of 200 tons per hour will have to be undertaken at some future time. It is manufactured of patent crucible cast steel, with a breaking strain of about 180 kilos., or with a total breaking strain of 19,950 kilos. For driving the ropeway, about 7 H.P. is at the present time required for the first section, and a maximum of some 9 H.P. for the second, or a total of 16 H.P. This power is furnished by an electric motor at the driving station, where all the cars uncouple themselves and are pushed by hand to the coupling-point. In order to render it possible to uncouple or allow the cars to pass at the retort-houses, depending on the

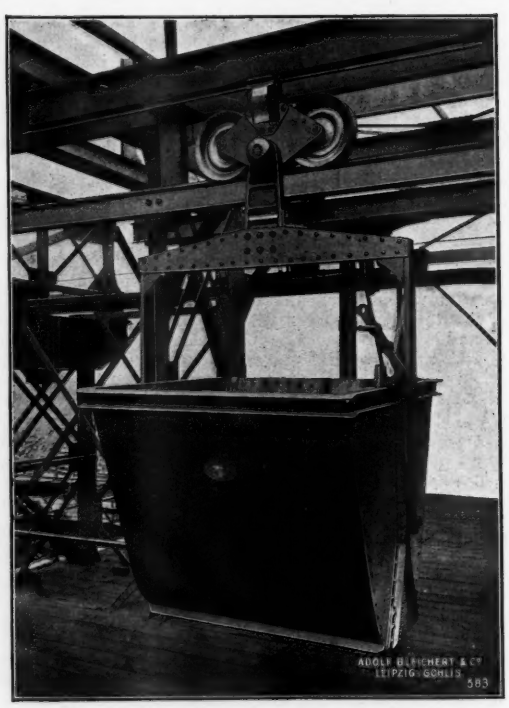
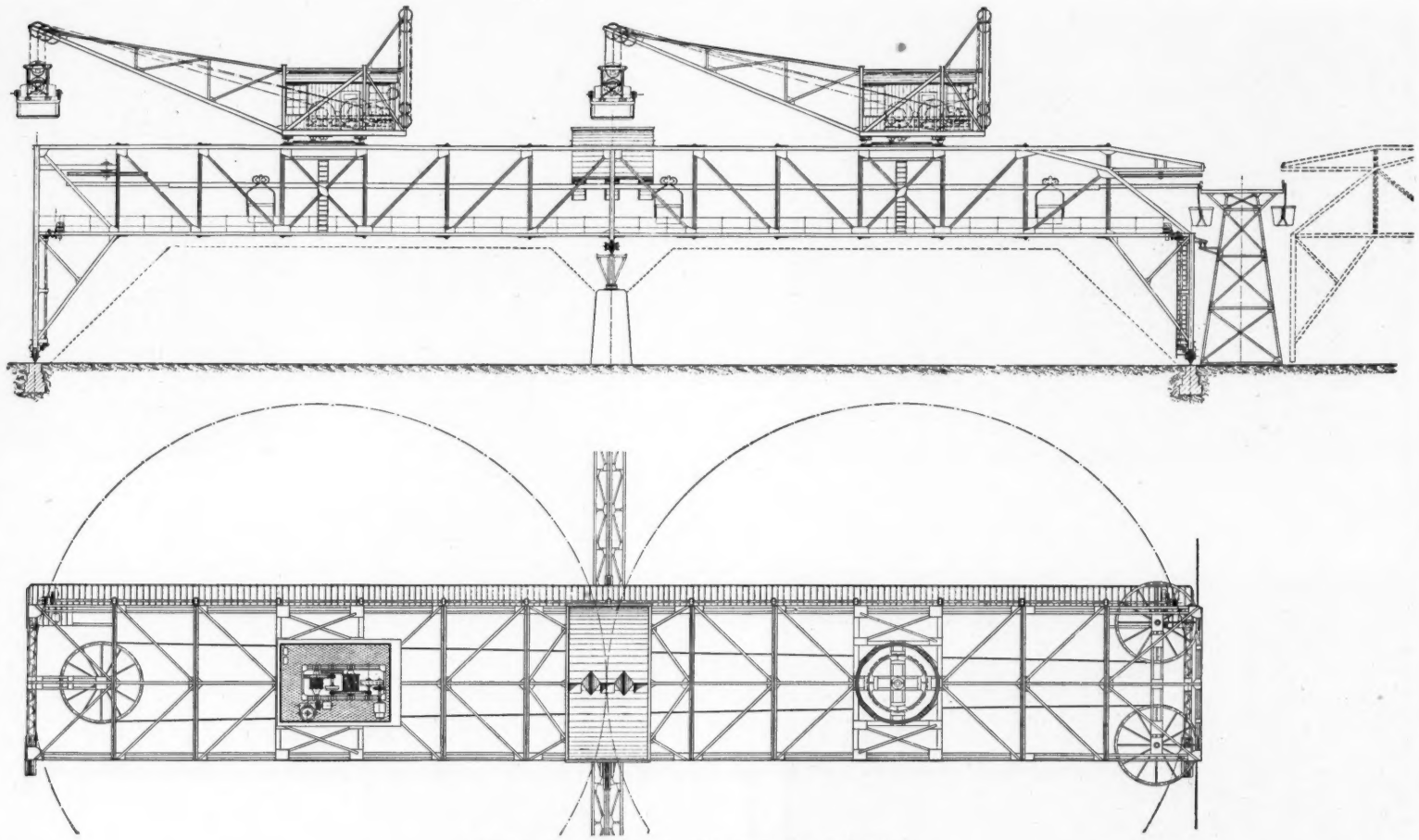


Fig. 9.—The Travelling Cars.

place where they are to be emptied, coupling-rails capable of being raised or lowered are provided at the dumping-points. This is necessary, as the cars must be weighed before they empty over the coal-breakers. The weighing appliances at the unloading station of the retort-houses have exactly the same construction as those for the large stacking-yard cranes. (See fig. 7.)

From the arrangements already explained, it will be seen that attendance is only required for the traffic from the port to the retort-houses at the following points: At the port crane, at the driving station, and at the retort-houses. On the other hand, all curves and stacking-yard bridges can be crossed without any attendance. When coals are to be dumped in the yards, both coupling-points at the retort-houses are disconnected, so that the men engaged there are free, and can be employed to overlook the traffic over the stacking-yard bridges and the detaching appliances for the automatic emptying of the cars. Of course, in this case the cars must be allowed to cross the whole of the upper part of the ropeway, without being uncoupled from the traction rope. In handling traffic from the stacking-yards to the retort-houses, the lower part of the wire ropeway from the port to the driving-station is put out of action. This is effected by disconnecting the rope-sheave in question by means of the lever coupling. The cars coming from the retort-houses to the station can be pushed into the other section on a turntable provided in the driving-station, and thus returned direct to the retort-houses or the stacking-yard bridges as the case may be.



Figs. 10 and 11.—Elevation and Plan of the Crane Bridges.

For reloading the coal in the yards, two rotary cranes (figs. 10 and 11) are, as already mentioned, built on each of the two unloading bridges, and raise the coal into the hopper by means of an automatic grab. Each crane is calculated for an hourly capacity of 50 tons; and the grab lifts from 25 to 30 loads per hour, each load averaging 2 cubic metres, from a full coal stack. The gross carrying capacity of each trolley is about 6500 kilos., 14·25 metres being the longest projection. The hoisting height of the grab is 13 metres, or a speed of 0·5 metre per second. The slewing speed of the jib is so calculated that the grab can move in a circle at a speed of 1·5 metres per second. The weight of the grab is, for the most part, balanced by a counterweight of about 13 tons, which is requisite for the stability of the crane; but it is also utilized to economize the working power. It is moveable, and placed in a shaft where, by means of a block and tackle and toothed-wheel gearing, it acts on the drum as a weight lever. As in the case of the port crane, the grab is under the action of two independent brake arrangements, either of which will bring it to a standstill. By this arrangement of a counterweight, considerable saving is effected in power for the hoisting winch. This power is supplied by a motor of 35 H.P.; whereas the slewing motor for the crane is of 8 H.P. If the counterweight had not been used to assist in the hoisting work, motors of 100 H.P., instead of 35 H.P., would have been found necessary.

The electric current is conveyed to the slewing crane through the main pivot through which the line is carried in connection with a slide contact. As weight carriers for all grabs, double wire ropes of crucible cast steel are used, which are of a strength to provide for a sevenfold safety guarantee. All rollers and drums—contrary to the usual method of construction—are of very large diameter. Of course, all surfaces with which the ropes come into contact are turned or suitably adapted.

Each crane bridge (figs. 10 and 11) has a total span of 57 metres, and runs on two lines fixed in the stacking-yard parallel to the middle fixed suspension railway bridge. Eight wheels, in pendulum frames, run on each line, giving a total of 16 wheels. The crane bridge consists of a double lattice girder, erected at its extremities on triangular supports, so that the bridge forms an arch with a very wide span. The height of the supports is calculated to give a clear elevation of the under arch of 7 metres above the

yard. Over the cross binders of the under arch a floor is laid, serving as a gangway for the employee attending to the hoppers and suspension rail cars. The slewing cranes stand on specially strengthened cross binders of the upper arch; and the loading hopper is also hung between the upper arches. The suspension rails, or tracks for the suspension railway cars, are built in hangers, fastened to the cross binders of the upper arch. Outwards they run into a curve, inwards towards the fixed longitudinal bridge into sliding switches, which rest on the rails of the fixed suspension railway.

As can be further seen from the illustrations, three rope sheaves lie above the rails—one deflection sheave being over each of the two slide switches, and a curve sheave over the return slide. The traction rope is carried over these sheaves, so that the cars coming from the railway can pass the bridge without delay. Of course, coupling rails, capable of being raised or lowered, are inserted before the hoppers, to enable the cars to be stopped as required or filled and sent on farther. The maximum weight of a bridge, including the cranes, counterweight, and car load, as also the contents of the hopper, is about 250 tons, so that the maximum wheel pressure is only 15 tons. To provide a sound track for the crane under all circumstances, the railway lines in the yard, which weigh 44 kilos. per metre, are placed on longitudinal rails, which are again fixed on a brick foundation, so that settling of the line at certain points is impossible, and any upkeep almost unnecessary.

The bridge for carrying the whole crane travelling on both parallel tracks is driven from both sides of the bridge, so that any swaying in travelling is entirely avoided. The guiding appliances for working the crane movements are placed on a driver's platform near the hoppers, so that the movement of the whole bridge is regulated by one of the workmen attending to the hoppers. The travelling speed of the bridge has been purposely kept fairly low, as the movements which the crane bridge has to make while the grabs are at work are very slight—only about 15 metres per minute. The necessary power for driving the bridge is provided by two 25 H.P. motors.

Regarded in their entirety, the loading arrangements planned and carried out by the firm of Adolf Bleichert and Co., must, we think, be considered as a solution of the problem which, with the means at present known to suspension railway experts, could hardly be improved upon. This is the more striking when the enormous bulk of the traffic in question is taken into account, in conjunction with the fact that for attendance on the whole plant only about ten men are necessary. Consequently, the transport of coal from the yards to the retort-houses comes to only 1¾d. per ton, and to 2d. per ton from the port to the yards or to the retort-houses.

*(To be continued.)*

## ELECTROLYSIS OF GAS-MAINS.

This was the subject of a paper prepared by Mr. M. R. Bump, of Denver (Col.), on behalf of the Western Gas Association, for presentation at the first annual meeting of the American Gas Institute. The aim of the author, as explained in the opening paragraph of his paper, had been to reduce to a compact form the various views in regard to electrolysis now accepted by gas and water engineers, and to set forth certain facts which had not received the attention and discussion they merited. He offered first a few observations on the fundamental theory of the electrolytic cell, and then proceeded to deal as follows with the general subject of his paper.

The correctness of the theory of electrolytic action has recently been challenged by Dr. Louis Kahlenberg, who has gone very extensively into the chemistry of the subject, and who presents a long list of arguments, based on experiment, that apparently disprove the theory. This makes little difference to the gas man; for, with the laws worked out, he can calculate the effect of the action, and this is the point in which he is interested. There are two fundamental laws which govern the amount of electrolytic action, and with these the effect can be determined for any particular case. They are as follows: (1) When an electric current is passed through an electrolyte, the quantity of the liquid decomposed—*e.g.*, the extent of electrolytic action—depends on the amount of electricity, measured in coulombs, which passes through the electrolyte, and is independent of the size of the electrode and of the electric pressure applied. (2) When equal quantities of electricity are passed through different electrolytes, equivalent quantities of the electrolytes are decomposed—*e.g.*, a coulomb of electricity will decompose a certain amount of a chloride solution, and a different but equivalent amount of a sulphate solution. These amounts always bear a definite relation to each other.

The first law states that the amount of electrolytic action is independent of the pressure applied. Here is where many mistakes have been made by gas men who have expected to find the greatest electrolytic action where the voltmeter showed the highest reading between the rail and the pipe. The customary pressure charts of our cities have, for this and other reasons, very little value, except to define the bounds of the so-called "negative" area. The fact that the drop from the pipe to the rail is large, indicates that the earth at that point is a very poor conductor of electricity, and that the current flow between the two is small. Often the greatest amount of corrosion is found at points where the difference of potential is almost too small to determine, being only one or two milli volts.

The first law also makes it plain that 1 ampere of current flowing from a pipe will destroy a certain definite amount of iron, whether the pipe is 2 inches or 60 inches in diameter, provided the pipe is in the same quality of earth. The second law, relating to quantities decomposed, is stated in a reverse manner from that desired for the use of gas men. A given quantity of electricity will decompose a certain amount of iron, if ferric or the higher salts are formed, and another definite amount if ferrous salts are formed, regardless of whether the electrolyte is a chloride, a sulphate, or any other acid. Metals like iron that form two series of salts possess this quality. For others that form only one series, there is always but one quantity decomposed by a given amount of electricity.

It has been generally supposed and accepted that damage to a pipe occurs only where current leaves it; and in general this statement is practically correct. But I am informed by Professor Burgess that it has been proved that in some cases current entering a pipe has caused an acceleration of the corroding action on the pipe. An explanation of this action may be found in the fact that pipes subject to the natural corroding influence of the surrounding earth become covered with a deposit that protects the pipe from further corrosion. When a current enters a pipe, it may destroy the covering thus formed, and leave the pipe subject to further corrosion from the surrounding earths.

All are familiar with the attempts made during past years to induce or force traction companies to adopt better return construction. First, better bonding was demanded, and was in a measure obtained. Next, a system of return feeders to supplement the rail return was added; and still the troubles were not materially lessened. Some few cities tried to compel the traction companies to supply the double-trolley system; but this has not proved a success. Litigation has been said to have cost some companies more than the damage from electrolysis; but it would seem that it has availed little in forcing the needed relief. As a general rule, those companies have fared best who have enlisted the co-operation of the traction companies in an endeavour to reduce the damage to the lowest possible point. Some traction companies have paid a portion of the cost of renewing pipes destroyed by electrolysis; but these cases are exceptional. While we have direct current traction, other means must be found.

At the present time a new factor is entering into the problem, and one that happily offers relief to a large degree from the damages caused by electrolysis. I refer to alternating current traction. This new system is giving to the electric traction industry a new impetus, which up to the present time has been confined largely to inter-urban and long-distance lines, but which is destined to come into use in our large cities as soon as it is proved practicable on the longer lines; and there seems to be no reason to doubt the practicability of the system. It is a well-known and established fact that an alternating current does not cause electrolysis to nearly so great an extent as does direct current. In fact, it is often stated that the alternation of the direction of flow will entirely stop electrolytic action. On this point, however, there seems to be some question. In a thesis presented for a degree at the University of Wisconsin, a report is made of a series of tests to determine the amount of electrolytic corrosion caused by the ordinary 60-cycle alternating current; and the findings establish the facts that corrosion is accelerated by an alternating current, though the amount of action is very small compared with direct current electrolysis. It is possible that the increase in corrosion in this case is not due directly to electrolysis, but to the fact that the protecting scale does not form, as I have explained in the case of a direct current entering a pipe and causing increased corrosion. An extended series of tests would be necessary to decide upon the correct solution of this point.

In view of certain legal decisions that the railway companies can be compelled to provide the system which is considered best modern practice, it would seem that the interest of gas companies should be enlisted in an endeavour to prove that the new system is the best modern practice; and I am confident that within ten years it will be regarded as such.

Leaving the consideration of this matter, I wish to take up the question of protection of existing systems from direct-current electrolysis. Gas men are apparently almost equally divided into two classes, each of which maintains that electrolysis is best prevented by their general system of protection. Broadly speaking, these two classes are as follows: (1) That which believes in bonding the pipes to the return circuit, and causing as much of the current as possible to leave through these bonds; and (2) that which aims at making the pipes as poor conductors as practicable, and thus preventing as far as possible all current from entering their pipes. In addition, there are to be found various combinations of the two general systems.

Taking up the first class, it is apparent that, if all current could be collected and kept on the pipe until removed through the bond, it would offer an ideal solution of the problem. The placing of bonds between the pipe and the return circuit in the negative area, however, not only does not help conditions, but makes them much worse. The conductivity of the circuit through the pipe is increased greatly, and as a result more current follows the pipe. With cast-iron mains, we find the greatest trouble is caused by current jumping round the joints; and the greater the flow of

current in the pipe, the greater becomes this tendency to jump the joints, and therefore the greater is the damage to the system. This is especially true where cement joints are employed; and there seems to be hardly a case where bonding would be advisable when these joints are used. Even if the pipe were of uniform conductivity, there would be a tendency for current to follow the pipe through earths of high resistance, and leave it again when earths of better conductivity are encountered. In order to make an ideal of this system, it would be necessary to provide pipes the conductivity of which would at all times be so much greater than that of the surrounding earth that little current would tend to leave the pipe for other paths. This, however, is a physical impossibility; and the system offers at best little relief in the average case.

The other general system has as its ideal fulfilment a pipe that is a non-conductor. It aims to keep all current from following the pipe. From the gas man's standpoint, it is the ideal system. When bonding is advocated by gas companies to remove current from their pipes, they partially, at least, concede the right of the traction companies to use their pipes as a return circuit. This weakens their position in case they take a claim for damages into the Courts. The nearest approach to the ideal system is found in the extensive use of insulating joints to break the continuity of the pipes as return conductors; thus reducing the current carried by the pipes to as small an amount as possible. The proper installation of insulating joints is a very important engineering problem, and one in which every case is a special problem involving quality of earth, moisture, &c., the aim in each case being to allow as little current as possible to jump round the joint.

Of recent years, the tendency to use wrought-iron instead of cast-iron mains has spread wonderfully. Without involving myself in a question as to the relative merits of the two, I wish to call attention to the statements of a manufacturer of insulating couplings and patent couplings extensively used for natural gas, to the effect that it is possible to lay wrought-iron pipe with an insulating coupling every second joint at less first cost than for a screw pipe of the same size. This point is well worth careful consideration by every gas manager. Regarded from the standpoint of reduction in leakage, the shorter life wrought-iron pipe is overcome by the reduction in cost and unaccounted-for gas compared with cast-iron pipe.

Electrolysis occurs when a current leaves a conductor through an electrolyte. In our case, the pipe must be a conductor, and the current must leave through earths that are electrolytes. This indicates two fundamental methods of curing our troubles: (1) Use pipes that are not conductors; (2) insulate all pipes from the surrounding earths by a protective covering. Quite recently there has been announced in France the result of tests with paper gas-mains that offer considerable promise. The mains in question were tested under 300 lbs. pressure, and then subjected to regular service in the ground for some time. They were pronounced as good as new when removed for inspection. I am informed that experiments along this line are being started in America.

Some years ago, the use of vitrified pipes was much agitated in this country. Climatic conditions seemed to preclude the possibility of u ing them in the northern sections. More recently English pasents have been issued of a concrete pipe and system of installatton. With the present activity in steel concrete construction, iit would seem that there is considerable promise along these lines. The strength of the pipe could easily be designed to at least equal that of cast iron. Several experiments have been tried along this line, and I expect to see the matter presented in definite shape for the consideration of gas and water companies within a short time. It would certainly make a report of the greatest importance.

The second essential in the prevention of electrolysis would seem to offer a most interesting field—the invention of a pipe covering that will protect the pipe, and prevent current from leaving it through an electrolyte. The prime factor in such a covering is that it must be moisture-proof, in which case it would of necessity be gas-tight. Leakage could not occur. How much added investment could our companies make per mile of main to prevent leakage alone? Balance interest on investment against the cost of gas lost by leakage, and the results will show what expenditure would be justified from this point of view alone.

The subject of coverings for mains and service pipes has been extensively investigated; but, so far as I know, no one has produced an entirely successful material. Some recent experiments with a cement covering for pipe have shown that there is a great deal of merit in it, if properly applied. Several different tar mixtures, such as the Hickenlooper, are in use for tarring service and small main pipes. That they are beneficial cannot be denied; but they are not efficient enough. Tarring and boxing service-pipes has proved a decided success in some cities; and records show that they greatly increase the life of the service and decrease the leakage. Boxed pipes showed very little deterioration from corrosion; and to my mind this process offers the best protection in use at the present time, and it seems to be increasing in popularity. Attempts are being made to devise a covering that can be moulded on the pipe at a low first cost. Forcing-jacks are coming extensively into use; and strong casing would be required if the pipes were to be forced. Such a covering would have many advantages, and would be a very excellent thing.

The whole subject of electrolysis as applied to any case should be studied with one fundamental law in view—viz., "Prevent all current from leaving the pipes through an electrolyte." The nearer we can approach to this, the better will conditions become. The interests of the gas fraternity are at present directed largely to the following features of the problem, and future advances towards a solution of the problem may be expected from them. These features are: (1) The introduction of alternating current traction in our cities. (2) The development of a satisfactory protective covering. (3) The development of a new class of electrolysis-proof pipe. (4) The application of the fundamental rule to existing systems and conditions.

## COKE DUST BRIQUETTES.

A DESCRIPTION has been given in a recent number of the "Journal für Gasbeleuchtung" of the utilization at the Riga Gas-Works of coke dust in the manufacture of briquettes. It is from the pen of Herr Max Rosenkranz, the Works' Superintendent, and touches upon several points of general interest.

The coke dust referred to comprises the fine material up to the size of peas, which is produced in rather large quantities when coke is broken, and is also formed in the store heaps, and in the handling of coke, more especially when it is exposed to the influences of frost and rain. At Riga, the amount of this dust ranges from 4 to 6 per cent. of the weight of coal carbonized. This is independent of the fine breeze ($\frac{1}{4}$-inch to $1\frac{1}{2}$-inch pieces), which is used for firing boilers. The dust had been extensively applied as a pugging material in floor construction; but nevertheless large accumulations of it in time occurred on the works. Only about one-tenth the price obtained for breeze and coke could be realized for this dust. It did not serve well as boiler fuel, even in various special dust-firing grates, as the actual dust was blown unburnt into the flues, and had to be removed thence. The special grates were adapted for the use of fine breeze free from dust. But even if suitable grates had been available, only about half the supply of coke dust could have been consumed on the gas-works.

Herr Rosenkranz had for some years past tried various binding materials for working up coke dust into briquettes, and finally obtained a small briquette press and accessory plant, which has been in operation about a year. The press is of a size to turn out some 1000 briquettes per hour, weighing rather less than 1 lb. apiece. The coke dust is fed by an elevator into a mixing funnel, along with finely-ground hard pitch intimately mixed with it and warmed by means of superheated steam. The complete plant and building for it cost about £500. The steam, however, was taken from the works' steam-pipes, and merely superheated in a furnace attached to the briquette plant. At first, when the coke dust happened to be not quite dry, the briquettes were not sufficiently uniform and hard; but after awhile better working was attained, and good briquettes were made even from quite wet coke dust. About 5 per cent. of binding material is used. In a ten-hours working shift, about 83 cwt. of coke dust is worked up. At times thick tar residues are used to economize the somewhat costly hard pitch. The briquettes burn well, and do not fall to pieces in the fire. Their calorific value is practically the same as that of coke. They answer well in the producers of the retort-settings, as the clinker is less hard and difficult to remove than that of coke, and are therefore liked by the stokers. They are quite satisfactory as boiler-fuel, and in the stoves in the offices and workshops. They have thus set free for sale an equivalent quantity of good coke. The wear and tear of all parts of the briquette-making plant which come in direct contact with the coke dust is very heavy; but nevertheless, even if it were heavier, the plant would afford a good profit. There were made up to December last 1547 metric tons of briquettes, which set free for sale 1473 tons of coke, which realized about £1826 10s. The cost of making the briquettes was as follows:—

| | | |
|---|---|---|
| 1430 tons of coke dust, at highest sale price . . = | £164 | 9 |
| 100·2 ,, ,, hard pitch . . . . . = | 473 | 8 |
| 15·8 ,, ,, thick tar . . . . . | 31 | 6 |
| Wages . . . . . | 136 | 17 |
| Repairs and renewals . . . . . | 54 | 11 |
| Depreciation, 10 per cent. on plant, 4 per cent. on building . . . . . | 34 | 18 |
| Interest, at 6 per cent. . . . . | 30 | 13 |
| Total . . . . | £926 | 2 |
| Net profit . . . . . | 900 | 8 |
| Value of coke available for sale . . | £1826 | 10 |

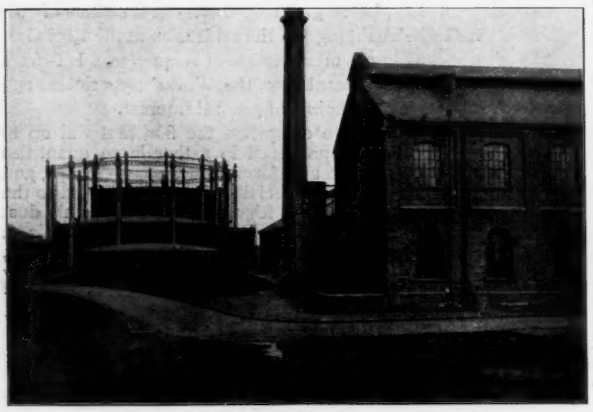
This result could be improved upon by further economy in the use of hard pitch, and by reduced expenditure on repairs, which a slight simplification of the plant would render possible.

Some weeks ago, a Committee was formed to take steps for establishing a permanent memorial to the late Sir Richard Tangye. A meeting of the Committee was held at Birmingham, last Thursday, when a report was presented by Alderman the Right Hon. William Kenrick, as to his inquiries in regard to sculptors, and a Sub-Committee was appointed to correspond with two well-known artists and report the result to a future meeting. The memorial is to take the form of a mural tablet with two medallions, to be erected in the Art Gallery. Any surplus there may be after the tablet has been erected will be devoted to the foundation of a scholarship or exhibition in onnection with the School of Art.

# THE BRACEBRIDGE GAS-WORKS OF THE LINCOLN CORPORATION.

**The First De Brouwer Combined Machine.**

As will be seen by our report elsewhere, the members of the Eastern Counties Gas Managers' Association paid a visit of inspection last Thursday to the chief works—the Bracebridge—of the Lincoln Corporation Gas Department; and, although the works, except in regard to the more modern introductions, are ordinary in character, there are about them several points that



**View from the Entrance to the Works.—The Carburetted Water-Gas Plant House.**

claim interest. Whenever one gets into a historical city like Lincoln, the past seems to be brought into much closer connection with the present than in a town or city whose history is not crowned by centuries, by imposing events of the long dead past, or by structural memorials that are of national pride. There was much heard about the past and present glories of the city during the proceedings at the meeting; and the history of the gas undertaking did not escape being brought into prominence. Therefore, a general sketch of the Bracebridge Gas-Works, we think, will not be without interest.

**General View of the Bracebridge (Lincoln) Gas-Works taken from the Street.**

### Magnitude and History of the Works.

The description may be prefaced by some general information. The Corporation Gas Department have two works—the Bracebridge and the Newland. The last annual returns show that at the former 20,081 tons of coal were carbonized in the twelve months; while at the Newland works, 8127 tons were carbonized. But at the larger works, there is also a carburetted water-gas plant. The make of coal gas at Bracebridge last year was 223,510,000 cubic feet; and at Newland, 87,228,000 cubic feet. At the former station, 43,939,000 cubic feet of carburetted water-gas were also produced—the total make being 354,677,000 cubic feet.

The foregoing figures show the magnitude of the works as they stand at present; and a little dip into their history will not be out of place here. The Newland works are the older ones. They were first constructed in 1829; and part of the original buildings is still in evidence, which shows how well and truly they were built. The Bracebridge works were not erected till 1876. In 1883, the Newland works were remodelled, and practically rebuilt by the then Consulting Engineers, Messrs. G. W. Stevenson and Son. A year afterwards, they took the Bracebridge works in hand, and converted them to what was more in accordance with current notions. For instance, they did away with the Körting steam-jet exhauster and the old brick ovens. The works are now, save for the modern plant that has been introduced and the renovation and maintenance work that has been done, very much as they were in 1884. The carbonizing plant has only been altered by the adoption of regenerative firing; and the additional plant introductions consist of sulphate apparatus, constructed in 1895, carburetted water-gas plant in 1900, and now, in 1907, the new (and first) De Brouwer combined charging and discharging machine, with the auxiliary coal-handling plant.

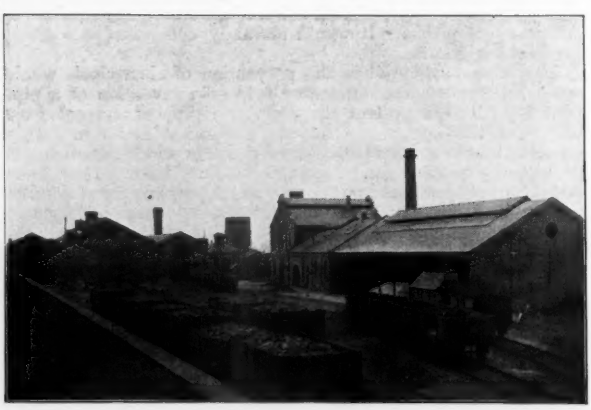
### The Retort-House and Other Plant.

The retort-house as it now exists contains eleven settings of seven retorts, and one of eight—all Ω section, 21 in. by 15 in. by 18 ft., heated, as already said, on the regenerative system. The settings have been developed. In the case of half of the twelve, shallow regenerators were tried; but they have been deepened to full-depth regenerators—both system and construction being of home devising and execution. It has been mentioned that one of the arches contains eight retorts. This was experimental; and the result is that, as occasion offers, reconstruction of beds will see the additional retort incorporated in them. This, however, will necessitate two retorts in each setting being worked with one ascension, as has been successfully done in the case of the trial bed. In this connection, a point which attracts attention is that the ascensions are only 5-inch ones, with an enlargement to 6 inches at the mouthpiece. It was doubted whether the single 5-inch pipe would be sufficient; but we are informed that, in the experimental setting, there has been no more trouble from stopped pipes than in the case of the others—one at either end of the retorts. Another alteration is this. In view of the adoption of a pusher for discharging the retorts, and seeing that the coke will in future be expelled on one side of the bench only, three settings that were reconstructed last summer were made into single producers; and the others have been altered by filling up one side of the producer and building in the doors.

The other plant connected with the coal gas section may be lightly run over before dealing with the more modern plant. There is nothing specially noticeable about the retort-bench mountings; and so, following the course of the gas, it is found that, after travelling through the foul main round the retort-house, the gas passes through one of Messrs. R. & J. Dempster's annular condensers. The reciprocating exhausters are of Messrs. R. Dempster and Sons' make. The gas is next dealt with by a Kirkham, Hulett, and Chandler washer, passing next through the scrubbers, thence through four purifiers charged entirely by oxide of iron, and onwards to the holders. The scheme of the coal gas plant is all through to provide for an output of 1 million cubic feet a day.

### The Delivery of Coal.

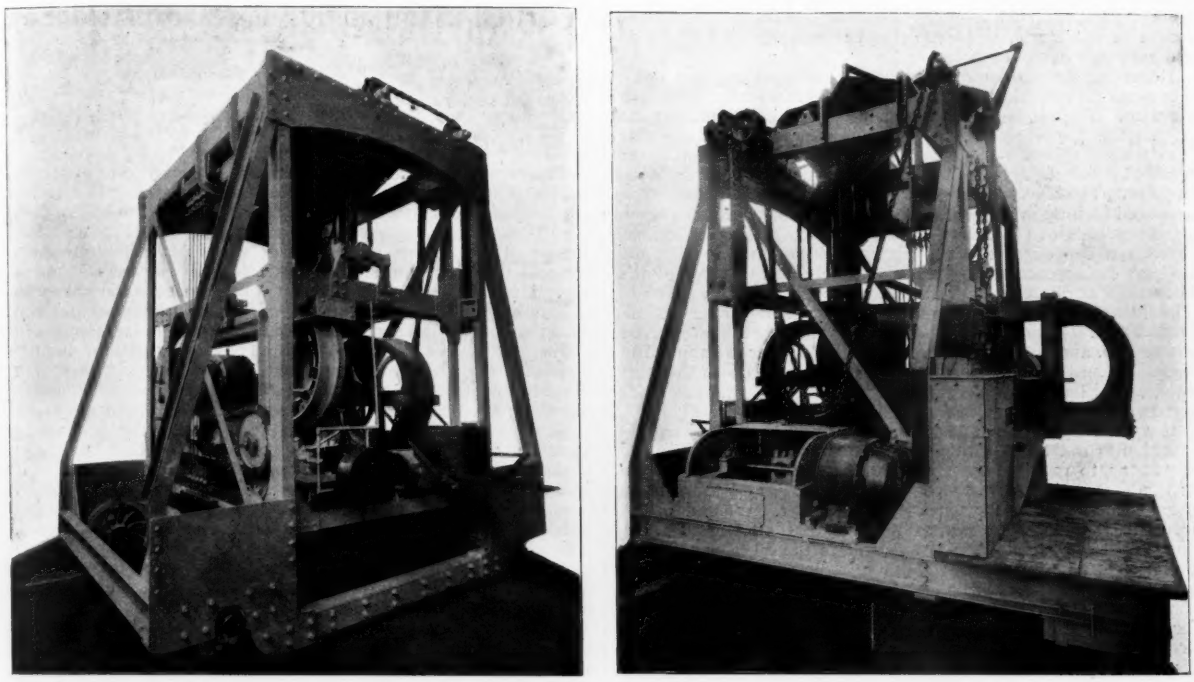
Retracing our steps to the retort-house, there is the new combined De Brouwer machine and the coal-handling plant to be described; but, before dealing with it, there are a few points for observation connected with the method of treating the incoming coal. The works are connected by a siding with the Great Northern Railway system. This siding enters the works, and then divides into two loops—one going to each side of the retort-house. The full waggons are drawn by means of capstans on to a hydraulic hoist, and



**The Railway Sidings and Yard.**

[The Retort-House in which the new Combined "D.B." Charging and Discharging Machine is installed is the Building, flanked by the Coal-Stores, forming the background towards the left-hand side of the above view.]

elevated to an overhead gantry, and thence emptied, through bottom doors, into the stores on (until recently) either side of the house. So far as demand will allow, the coal as received will now, of course, be dealt with immediately by the new plant—emptied direct into the coal-breaker and elevated into the overhead hoppers, with a capacity of 120 tons, which, it is estimated,



**The "De Brouwer Jenkins" Combined Retort Charger and Pusher at Lincoln.**

will be well above the maximum 24 hours' consumption, so that their replenishing can be accomplished during the daytime.

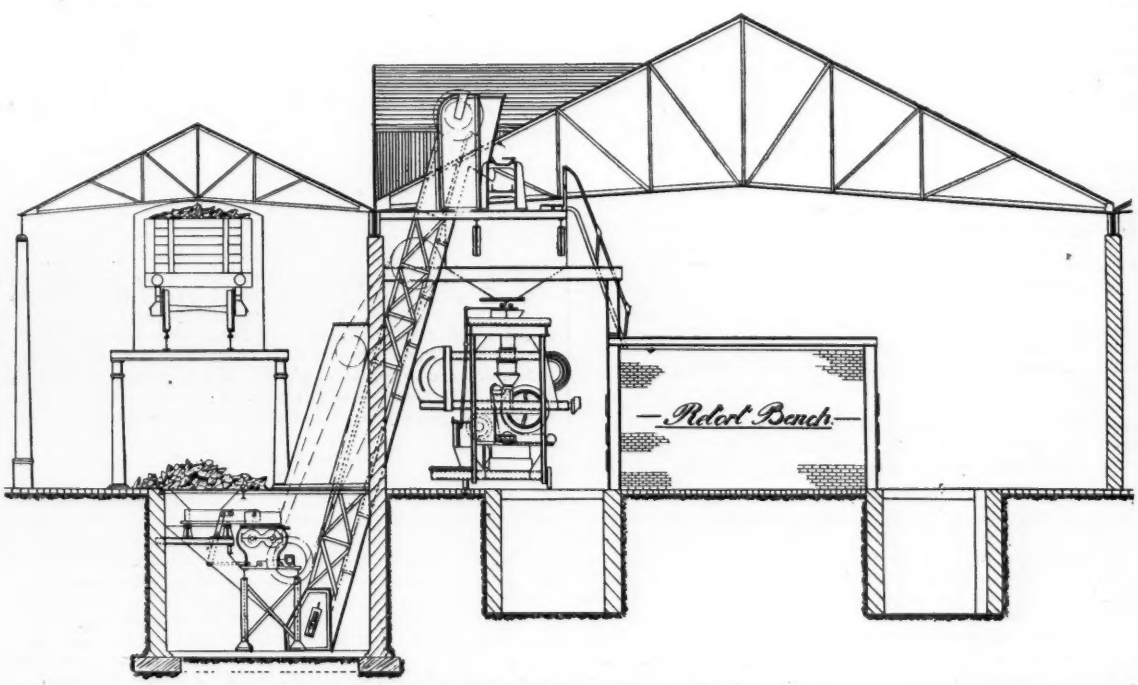
### Condition a Determining Factor.

There is one point about the retort-house which is noticeable in inspecting this new plant. The house has not been structurally altered in any way; and the plant has been made so as to accommodate itself to the house. As a matter of fact, the house is an extremely narrow one—only 17 ft. 6 in. between the surfaces of the retort-bench and the coal-store walls; so that nothing but a machine of the De Brouwer type would have been of any use. And by-the-bye, too, it must be said that at these works they have been doing very well with hand labour. The last annual returns show that the make was, on the average, 11,300 cubic feet per ton of coal carbonized.

### The "D.B." Combined Machine.

As we have said, the new De Brouwer combined charging and discharging machine is the first of its class to be put into operation. It does not differ greatly in appearance from the ordinary "De Brouwer Jenkins" discharging machine. On close inspection it becomes clear that the frame of the ordinary discharging machine has been widened out, so as to allow of space for an ordinary standard "D.B." patent coal-projector to hang side by side with the discharger and in the same hanging frame. The propelling controller has been moved into a central position on the platform; in order that both parts of the machine can be adjusted to the retorts by sighting between them. The coal is supplied to the projector from the overhead hoppers, through slides in the bottom of the hoppers; the slides being controlled by a lever on the frame of the machine. The lever has a pair of jaws at the top, so arranged that, when the slide is shut, the jaws open out like the blades of a pair of scissors—thus leaving a 6-inch gap between them, to allow of the machine being propelled along the rails without fear of fouling the hopper slides. Two views of this interesting machine are given.

The electricity is generated by a dynamo, direct coupled to the crank-shaft of a Robey gas-engine; the latter being of 35-horse power, and arranged to drive, by belting, the whole of the coal-handling plant as well as the stoking machinery. There is a switchboard in the engine-room, with volt and ampere meters and fuses; and the current is conveyed to the retort-house by cables




**Cross Section of the Retort-House at Lincoln.**

connected to two bare copper conductors stretched through the length of the house, and supplying the stoking machine by an ordinary pair of trolley poles.

Regarding the coal-handling plant, the coal-breaker pit contains a two-pair claw breaker, and the bottom boot of an ordinary bucket elevator. The pit is covered by a hopper and floor-plates; the hopper being arranged to supply an automatic feeder to regulate the delivery of coal to the elevator, and to separate much of the small coal out of the bulk to avoid unnecessary pulverizing in the breaker. The elevator delivers the coal to a push-plate conveyor, arranged high up in the roof, and passing through gaps between the truss rods of the principals. Over each setting of retorts, there is a hopper of 10 tons capacity (or 120 tons in all); the hoppers being carried on girders supported on the tops of the buckstays at one end, and on the coal-store wall at the other. The filling of the hoppers is quite automatic after the coal is unloaded from the waggons, as the feeder over the breaker regulates the supply, and each compartment of the hopper is supplied in turn. When full, the coal in the conveyor passes on to the next opening until all the hoppers are filled. The coal-handling plant has an hourly capacity of 20 to 25 tons.

It was a subject of comment during the visit that the charging-machine is not fitted with any kind of measuring or weighing apparatus, to regulate the size of the charge. One explanation of this is that the retort-house roof is very low, and there is, in consequence, no room for a measuring-chamber. We understand from Mr. Jenkins, of the contracting firm, that, after the first few days' working, the stokers easily regulate the charges to whatever weight is required; and there is really no necessity for a measuring-chamber. Weighing apparatus has been placed on some machines, and has been found to be useful—not so much for regulating the charge in weight, as for indicating to the driver when and how to regulate his speed so as to ensure good charges. In these days when the tendency seems to be towards very heavy charges—even up to full retorts—it is a question whether there is much advantage in a measuring-chamber.

### The Carburetted Water-Gas Plant.

This plant occupies a central position in the works, and is contained in a building specially erected for it. It is of the Humphreys and Glasgow type; and has a daily capacity of well over 550,000 cubic feet. Space has been left in the generator-house for another section to bring the plant up to a productive capacity of a million cubic feet, for which output all the auxiliary plant has been designed. It is observed that the boilers and blowing-engines are of local make—the boilers being by Messrs. W. Foster and Co., Limited; and the blowing-engines, by Messrs. Robey and Co., Limited. There is one thing that may be claimed with pardonable pride in connection with the working of this water-gas plant, and that is that the oil consumption is down to 2·34 gallons per 1000 cubic feet. Both the coal and the water gas, it should be mentioned, are produced with, as near as possible, an illuminating power of 17 candles, in order that there may be no change in its illuminating value when at night time coal gas only is supplied.

### No Water-Gas Distribution at Night.

We believe that, in connection with the distribution in admixture with coal gas of carburetted water gas, Lincoln stands unique. The remark just made points to it. It is stipulated by the Corporation that the distribution of gas containing a proportion of carburetted water gas shall be restricted to the hours between 6 a.m. and 8 p.m.; so that from 8 p.m. until 6 a.m., coal gas only is sent out into the mains. We can see certain disadvantages to the consumers in having gas of different composition distributed to them at different periods of the day, and at times to the Gas Department in regard to the economy of working under this system. But perhaps time will bring a change in this respect, when the growing consumption claims a greater output, and the choice is between an alteration of policy and further capital expenditure.

In connection with this nocturnal change in distribution, it may be noted that there are two storage holders at Bracebridge—the larger one being of 500,000 cubic feet capacity, and the smaller one of 350,000 cubic feet. The water-gas relief holder—60,000 cubic feet—is on the Gadd and Mason principle; and it has worked satisfactorily from the start. The larger of the storage holders is kept entirely for coal gas; and it is worked into at night and whenever carburetted water gas is not being produced—in fact, the connections are so arranged that it is absolutely impossible to send water gas into this holder. When working, as is customary in the daytime—two parts of coal gas and one part of carburetted water gas—the mixture passes direct into the smaller holder. From the holders, the gas flows through a 24-inch Cowan governor, and is carried towards the city for the greater part of a mile by a 24-inch main, which is then bifurcated into two 16-inch ones.

In concluding this notice, it is of interest to place on record that Mr. Carter first entered the service of the old Gas Company in 1880; and for four years he was Secretary. In 1884, the Directors invited him to accept the combined position of Secretary and Manager; and since the acquisition of the undertaking by the Corporation in 1885, he has filled the post of Engineer and Manager with fidelity and ability. Mr. Mainwaring has also been in the Corporation service for many years, and is now the Superintendent of the Bracebridge works.

## MANCHESTER JUNIOR GAS ASSOCIATION.

### Visit to the Brackley Coke-Works.

By permission of the Earl of Ellesmere and Mr. J. Wallwork, the members of the Manchester and District Junior Gas Association paid a visit to the Brackley Coke-Works last Saturday.

The President (Mr. R. H. Ginman, of Tyldesley) and members were met at the office and laboratory by the Manager (Mr. Bury) and his assistants (Messrs. Peck and Riley) and also by the Colliery Manager (Mr. Ainsworth). Here Mr. Bury gave them a short outline of the process carried on in the works; illustrating his remarks by a sketch of the Solvay coke-oven, which is the one in use. He pointed out the similarity of the process at Brackley to that of coal carbonization in gas-works. He said the material used was a slack, obtained from the adjoining collieries, containing about 5 per cent. of ash, and 30 per cent. of volatile matter; and the yield of coke obtained in actual working was slightly higher than the theoretical figure—being about 72 per cent. The gas obtained, of which 70 per cent. was used for heating the ovens, leaving 30 per cent. available for other purposes (in their case for generating steam), had the following percentage composition: O, 0·5; $CO_2$, 4; $C_6H_6$, 3·5; $CH_4$, 22 to 27; CO, 6; and $H_2$, 48 to 50; the rest of it being nitrogen. Its calorific power was from 550 to 600 B.Th.U. The illuminating value was about 10 to 14 candles; but the gas obtained during the earlier stage of the carbonization process, which could be easily isolated, was of quite 16-candle power. The yield of products from a ton of slack was about 4½ per cent. of tar, 1 per cent. of sulphate of ammonia, and 2½ gallons of 63 per cent. benzene.

The party then proceeded to inspect the plant. The ovens are in two batteries, each oven being 16 inches wide, 5 ft. 9 in. high, and 30 feet long. There are two gas-flues for heating the ovens, one on either side, each 12 inches wide. Four tons of washed slack are carbonized every 17 hours; and the plant is capable of dealing with 200 tons per diem. The gas is withdrawn from the top and centre of each oven, and passes into a hydraulic main, condensers, and washers, for the extraction of the ammonia and benzene. The latter is absorbed by heavy anthracene oil, and is then returned to the ovens or boilers as required. The coal is fed direct into the top of the oven from waggons, each holding 1·3 tons, running on overhead rails; and the coke is discharged by an electric ram into coke-waggons capable of containing the entire charge—the quenching being performed immediately the coke leaves the oven, to prevent oxidation. The waggon is then drawn to the screen by means of an electric cable, and the coke loaded into railway waggons. So complete are the arrangements that only about 20 minutes are occupied from the drawing of the charge to the coke being ready to leave the works. The benzol is recovered from the washings by treatment in a distillation column with wet and dry steam; while the ammoniacal liquor is worked up into sulphate of ammonia in a Dempster and a Walker still. Mr. Ainsworth also took the party to the pit bank to inspect the coal slack used on the works.

The thanks of the members were suitably expressed by Mr. Mosley (Stretford) and Mr. Woodhead (Manchester).

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Mr. Thomas Laidlaw, who was for many years Chairman of the Hawick Gas Company, died on the 13th inst., at the age of 77 years. He retired from the chairmanship two years ago, on account of ill-health.

We learn that 32 applications have been received in response to the advertisement which appeared in the "Journal" a short time ago for an Engineer and Manager for the Ramsgate Gas and Water Departments. These are now under consideration by the Council.

Sir Frederick Wigan, Bart., one of the Directors of the Cagliari Gas and Water Company, whose painfully sudden death on the 2nd ult. was recorded in the "Journal" at the time, left estate of the gross value of £530,569, of which the net personalty has been sworn at £450,210.

The death occurred on Saturday last, after a short illness, of Mr. George Edward Davis, the Editor of the "Chemical Trade Journal," and the author of "A Handbook of Chemical Engineering," in two volumes. Deceased was personally known to some of our readers, he having been an Inspector under the Alkali, &c., Works Regulation Acts for East Lancashire, Yorkshire, the Midlands, and the South of England. He formerly resided in Manchester. He was in his 57th year.

The report of the Roads Improvement Association for the year ended the 31st of December last, which will be considered at the annual general meeting on the 25th inst., shows that the dust problem has received special attention. As already mentioned in the "Journal," two competitions are being carried out in order to find the cheapest and most effective method of treating roads with tar to render them dustless for a period; and the permanent solution of the problem—*i.e.*, the construction of roads with dustless material—is not being lost sight of. A comprehensive Committee has been formed, called the National Dustless Roads Committee of the Roads Improvement Association, upon which are represented all organizations connected with users of roads. By a series of experiments, it is hoped to ascertain the best and most economical dustless materials for road construction.

# EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

## Meeting at Lincoln.

Meeting at Lincoln last Thursday, the members of the Association received a welcome from the Chairman (Alderman Wallis, J.P.) and members of the Corporation Gas Committee, supported by the Mayor (Colonel J. S. Ruston, J.P.) and the City Council generally, the warmth and cordiality of which it would have been impossible to exceed. The Great Northern Hotel was the *rendezvous;* and there the members were received by Alderman Wallis, his colleagues, and Mr. John Carter, the highly-respected and long-valued Engineer and Manager of the Corporation Gas Department. The Chairman of the Committee, acting under the sanction of the City Council, entertained the visitors at luncheon; and it was a goodly assembly that crowded round the hospitable board. Alderman Wallis presided with the *bonhomie* which is inseparably characteristic of him; and seated among those about him were the Right Worshipful the Mayor, the City Sheriff (Dr. Mansel Simpson), and Mr. S. Bainbridge, J.P.

### Reminiscences.

Expression having been given to the loyalty of the members,

The Chairman proposed "The Guests." In doing so, he said he should leave the welcome of the Association to the Mayor, who would do it in a much more fitting place—the grand old Guildhall. Meanwhile, he wished, on behalf of the Gas Committee, to do honour to the guests. Among them, he was pleased to say, was one of the Directors of the Lincoln Gaslight and Coke Company (Dr. Brook), who, many years ago, handed over the gas-works to the Corporation in a very fine condition. There were only two members of that old body of Directors now living—Dr. Brook and Mr. R. J. Ward, the latter of whom could not be with them that day. He (Alderman Wallis) thought he might claim that the Corporation had carried on the concern splendidly from the time they took over the works to the present. He associated the name of Dr. Brook with the toast.

Dr. Brook, in responding, said it was somewhat of a painful reflection to him to think that the reason he was addressing the members of the Association was that he was the old man of the party. He could go back 45 years in the history of the gas-works of the city, inasmuch as it was in 1862 when he first became a Director of the Lincoln Gaslight and Coke Company. There had been very many changes since then. But theirs was a good Company, they earned a good dividend, and they supplied good gas. [Laughter.] That seemed to surprise the gentlemen present; but it was also said that they charged a good price. He remembered that it was so. [Renewed laughter.] However, at the time they handed over the concern to the Corporation in 1885, the price was 2s. 10d., and now, 22 years afterwards, it was still over 2s. In the early days of which he was speaking, they had an extraordinary man at the head of the gas-works, whose life was devoted entirely to his work. He referred to their then Gas Engineer and Manager, Mr. W. R. Throsby. Mr. Carter had the advantage of being with Mr. Throsby. In 1882, the Company enlarged their works at Carholme Road and built new ones at Bracebridge as well. In that work, they had the benefit of the advice of Mr. G. W. Stevenson, the first Gas Engineer of the day. Mr. Carter had brains enough to utilize all the experience then thrown in his way; and when the Company sold their undertaking to the Corporation, they sold them something equally as good. They "chucked" in a good Engineer and Manager; but he ought to have commanded a good bonus. He (Dr. Brook) did not think the Corporation gave Mr. Carter one at the time; and he was not prepared to say whether they had done so since. In the days of the old Company, the Directors found Mr. Carter a faithful and skilled servant; and to his (Dr. Brook's) knowledge, he had continued so since. Referring to the competition of electricity with gas, the speaker said he used both in his house. But he paid about the same gas bill now that he did before he put in electricity; and, in addition, he had to pay £20 a year for electricity. However, he enjoyed it. He always regretted that the Company parted with the old concern.

The Chairman then read out the names of the first Committee who took over the concern from the old Board of Directors. The only survivors of the Committee were Colonel Williams, Alderman Wyatt, Mr. W. Watkins, J.P., and Mr. Bourne; while, as he had said, Dr. Brook and Mr. Ward were the sole survivors of the old Board of Directors.

The Sheriff also responded to the toast.

The President of the Association (Mr. E. J. Brockway, of Cleethorpes) said the members could not leave such a hospitable table without expressing their hearty appreciation of the right royal manner in which they had been received that day; and it was with the greatest possible pleasure he asked the members to express hearty thanks to Alderman Wallis and his fellow-members.

The Vice-President (Mr. J. Davis, of Gravesend), in a few well-chosen words, seconded the proposition, which was carried with musical honours.

The Chairman, in the course of his acknowledgment, remarked that he hoped the meeting would be both profitable and enjoyable.

### Visit to the Bracebridge Gas-Works.

Again the members were placed under indebtedness to their hosts. Outside the hotel were waiting two special tramcars to convey them to the Bracebridge Gas-Works. On reaching there, Mr. Carter and the Superintendent of the works (Mr. W. H. Mainwaring) took the members in hand; and showed them, so far as limited time would allow, the specially interesting features of the station. The principal were the carburetted water-gas plant, and the new installation of a De Brouwer combined discharging and charging machine, with complete coal-handling plant. The combined machine on this principle is the first to be erected. Unfortunately, the machine was not sufficiently advanced for operation; but, nevertheless, it monopolized most of the time at the disposal of the visitors.

[The new machine and the coal-handling installation are described in a special article, on the Bracebridge Gas-Works, on p. 226.]

### THE BUSINESS MEETING.

Returning to the city by the cars, the members at once proceeded to the ancient Guildhall, which had been placed at their disposal for the meeting by the Right Worshipful the Mayor.

### A Civic Welcome—The Vastness of the Gas Industry.

On assembling,

His Worship (who appeared in the rich insignia of his office) offered the Association, in the name of the Corporation, a very hearty welcome. He trusted that the visit would be a pleasant one, and that it would go to further their mutual interests, and to advance the prosperity of the great industry in which they were all engaged. In looking into the figures connected with the gas industry, he had been much struck by their vastness and great importance. He found that the extraordinary sum of 124 millions sterling was invested in the industry of gas production, that the coal consumption amounted to some 14½ million tons, that the gas annually produced, including water gas, amounted to 174,905 million cubic feet, and that last, but not least, the industry now paid in direct wages the sum of £3,000,000, and, added to this, one had to take into account that at least a similar sum of £3,000,000 was paid to other people who earned their livelihood indirectly from the gas industry. This showed what a vast industry it was with which the members of the Association were connected, and they were indeed a revelation to him (Colonel Ruston). He was not conversant with the engineering or practical details of the industry; but, like every other man, he had been able to watch the vast improvement and the great rise that had taken place in the industry in (say) the last ten years. He had with others observed that there had been a great struggle going on between those who promoted electricity and those who stuck to gas. But it had not been an unpleasant rivalry; it had been one in which intelligence had been brought to bear. Gas had made a very successful fight of it. In welcoming the Association, the city was paying a tribute not only to the organization, but to men who had contributed so much to the happiness of modern times. There was one among their number—a citizen of Lincoln—whom he had known for many years. He was a much-esteemed member of the city. They esteemed him for his high character, and for his ability; and they all felt that the interests of the city, so far as the Gas Department was concerned, were quite safe in his hands. On the part of the Corporation, his Worship expressed the hope that the Association would long continue to flourish, and pursue the good work for which it had so long been famous.

The appropriate address from his Worship was listened to with rapt attention.

The President having taken the chair,

Mr. W. D. Child (Romford) said he had been requested by the President to propose a vote of thanks to Colonel Ruston and the Corporation for having granted the Association the use of their grand hall for the meeting, and for the kind reception that the members had had. This kindly reception of the Association was due to the great appreciation in which Mr. Carter was held in Lincoln, for his high character, and for his excellent conduct of the gas undertaking. Mr. Carter was an honour to the Association; and he would do everything possible to preserve and raise its character. They were glad to know that Mr. Carter's general conduct in the affairs of life was so thoroughly appreciated by the citizens. For the reception by the Mayor and Corporation and the Gas Committee, the members tendered sincere thanks.

Mr. J. H. Troughton (Newmarket) said he had much pleasure in seconding the resolution.

The motion was passed with acclamation.

His Worship thanked the members for the kind words in which the resolution had been proposed, and for the hearty manner in which it had been passed.

### Minutes of Last Meeting.

The Hon. Secretary (Mr. T. A. Guyatt, of Ely) read the minutes of the last meeting, held at Tottenham on Sept. 26; and they were confirmed.

### Letters of Regret.

The Hon. Secretary also called attention to the letters of regret at non-attendance that he had received; among them being one from the President of the Institution of Gas Engineers (Mr. Charles Hunt).

### The Committee's Report.

The report of the Committee reviewed the proceedings of the past twelve months, and ended with the following statements:

The year commenced with a membership of 96. The Committee much regret to have to record two deaths during the year—Mr. James Beck and Mr. Charles Green. Two members resigned, and four severed their connection under rule 19. Four new members were elected; making a total membership at the end of the year of 92.

The accounts show that a balance of £35 7s. 8d. was brought forward; and subscriptions paid during the year amounted to £53 0s. 6d.—making a total of £88 8s. 2d. The expenditure was £47 16s., which leaves a balance of £40 12s. 2d., and one subscription outstanding.

Much useful work was accomplished by the newly-formed Commercial Sections, which, however, do not yet include all the members of the Association. The Committee desire to emphasize the benefits of these sections, and to express the hope that the membership of them will increase, and the sections be thus enabled to extend their sphere of usefulness.

On the motion of Mr. J. H. Troughton, seconded by Mr. G. R. Casterton (Melton Mowbray), the report and accounts were adopted.

### New Members and Associate Members.

Moved by Mr. J. Davis (Gravesend), and seconded by Mr. H. Wimhurst (Sleaford), the following gentlemen were elected:—

*Members:* Mr. J. N. Reeson, of Beckton; and Mr. J. Green, of Market Rasen.

*Associate Members:* Mr. James Randall, of Tottenham; Mr. F. H. Lamb, of Manchester; and Mr. F. Turner, of Nottingham.

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Mr. J. Davis (Gravesend) then read the following paper:

## A FEW NOTES ON THE MANUFACTURE OF CARBURETTED WATER GAS.

The experience of the winter season of 1900-1 found our existing carbonizing plant getting too small for the demands placed upon it, and that something it was evident in the shape of either a new retort-house or the complete remodelling of the existing houses would soon have to be provided to carry on the business economically and satisfy the consumers. Many difficulties were in the way, to prevent the erection of a completely new retort-house; while to take down the existing plant, remodel, and re-erect it, together with the necessary alterations and re-erection of the buildings themselves, would require more than one season to complete. Consequently, some auxiliary would have to be provided while the work was being carried out, or some grave risks run by non-provision. It was here, therefore, that water gas came to the rescue; and, after much thought and deliberation, my Directors decided to put up a plant which, speaking generally, has turned out so successful that the remodelling of the coal gas plant seems to be as far off as ever, and leaves some 30 per cent. of the present retort power still available.

The buildings and plant were erected in 1902; the former consisting of a generator house, engine, exhauster, and blower house, and sulphate house and stores. The system adopted is that known as the Merrifield-Westcott-Pearson type, and consists of a generator or producer, carburetter and fixing chamber, washer, scrubber, condenser, &c., with the usual circulating pumps, and coke-lift; the plant being of 300,000 cubic feet capacity per diem. The engines, blowers, and exhausters are in duplicate. The blower engines are of the vertical type, Tangye's make, of 29 B.H.P.; the blowers or fans of Sturtevant's production, and the engines and exhausters of Messrs. George Waller and Son's manufacture. Two Lancashire boilers, 18 feet long by 6 feet in diameter, comprise the steam-raising plant. The relief holder is one of the five existing coal-gas holders, adapted for the purpose but utilizable for coal gas when necessary. It is of 175,000 cubic feet capacity. There are four purifiers, 16 feet square, of the Green type, with dry centre-valve, a station meter of 30,000 cubic feet per hour capacity, and a photometer-house. The whole combines to form one complete gas-works separate and distinct from the coal-gas plant—the finished gas entering the coal-gas mains at the inlet of the holders.

At present, the generating section, with its washer, condenser, and scrubber, is not duplicated; and it is this portion of it that requires the greatest attention (especially when, as in the writer's case, the plant is worked to its utmost) if the best results are to be reached and maintained—these being, of course, the maximum amount of gas produced with the least amount of carbonic acid and the minimum consumption of coke and oil. If, however, 35 to 45 per cent. of the total gas sent out from a works consists of carburetted water gas, it is advisable—nay, it is almost imperative—to duplicate this part of the plant also, as, from the amount of retort power displaced in the coal-gas plant, serious complications might arise if anything happened in the generator-house to cause a cessation of work for (say) 48 hours in the depth of winter and with a full load on; for it would be impossible to, in that space of time, get in working order sufficient retort power to fill the breach, and one's storage capacity would have to be abnormally large to meet the difficulty.

So much has been said and written in the past concerning carburetted water gas, that it will not be necessary for the writer to further describe the apparatus in detail nor go thoroughly into the methods of working, as these are generally well known. The theory and practice have both been fully described by various writers at different times, and published in the technical journals. At Gravesend, an average of 20-candle gas is sought for, with, of course, as low a consumption of oil as possible per 1000 cubic feet of gas made, and with oxide purification only, for the writer's coal-gas plant supplies the water gas with fuel, and the latter gas to supply the enrichment.

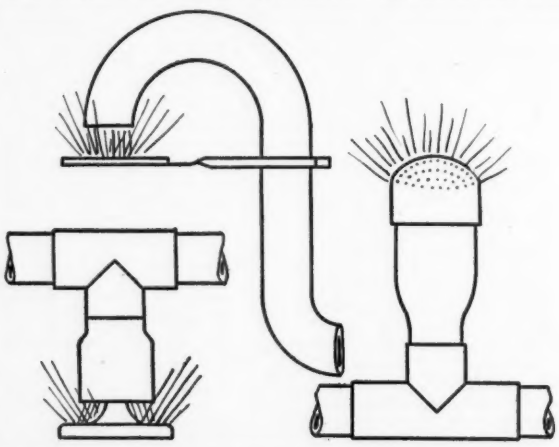
The nature of the work in the operation of water-gas plant has been described as "kid-glove work." True, there is no severe labour in it; and the operator might wear a top hat and patent leather boots (with, of course, other things), without doing them much harm, or himself appearing too incongruous. At the same time, it is not work suitable for every man, as the writer has discovered; for not only is it to a large extent very monotonous, but it requires men careful, steady, and of more than the ordinary intelligence, if of less physique, than the retort-house stoker. In large plants, doubtless, the monotony reaches the vanishing-point; but carefulness and intelligence are no less required.

It is to the generator principally that one looks to get the best results. This part of the plant stands in the same relation to the whole as the retort-benches do to the coal-gas plant; and it is to this apparatus that much of the success or non-success of the undertaking is due. The quantity and quality of the blue gas produced will vary considerably with the quality of the coke used and the condition of the generator, as well as with the application and regulation of the steam. The generator should be free from clinker, the fire kept well down on the bars, and the steam judiciously applied.

Some coals, particularly those from the Durham district, with which the writer is acquainted, while producing an excellent saleable coke, will, when used in the generator, soon produce a clinker which it is quite impossible to clear in the usual way; for, creeping up the sides of the brickwork, it is difficult to get at from the clinkering-doors. The writer has had from 2 to 3 feet of solid clinker form in this way, high above the reach of the clinker-bars; and it has been necessary to shut down the plant, cool the generator somewhat, and rig up tackle on the stage-floor to thoroughly clear it away. While the clinker remained, there was naturally a falling off in the gas production and a rapid rise of carbonic acid in the gas itself—the latter varying from some 3 to 10 per cent.

The coke produced from Yorkshire washed nuts works very well as a mixture with Durham coke in the generator. The Yorkshire coke burns very freely, but has a comparatively poor body. It has a tendency to bring any clinker which may have formed down on to the bars of the grate or furnace; and the stokers on the coal-gas plant, finding they have not half the labour with their furnaces in clinkering, rush for the Yorkshire nuts so long as any remain in the stores. Mixed, then, with Durham coke, the results turn out very well in the generator, and little trouble is experienced with undue clinker. The coke should, therefore, be clean, free from slag, and not too small.

Again, results are very much influenced in the application of the steam. It is very possible that in large plants the difficulties are not so great as in small ones. In the larger generators, the steam may be delivered from three or four jets, thereby getting a better spreading of steam throughout the fuel. In the smaller plants, however, where there is only one jet, if this is not properly placed and the fire not sufficiently low down on the bars, a rapid rise in carbonic acid will be experienced. The writer has tried



several devices for introducing the steam to the best advantage, all of which have worked well for a time, and then suddenly, and for no apparent reason, the returns have gone down, and an abnormal amount of carbonic acid has been formed. At present he is using a rose made out of wrought-iron fittings, as shown in the illustration, and it is giving very good results—bringing the make of gas up and the carbonic acid down to the normal condition.

The practice at Gravesend is to "blow" for three minutes, with a five minutes "run." Other periods have been tried; but

the system adopted gives the best results. The oil is shut off for about 1½ minutes before the end of the run, and steam turned on for a few seconds, to clear the injectors. While the injectors are are rest, a little steam is allowed to pass through them. This keeps them comparatively cool, and prevents the oil passages from carbonizing up. The superheater as well as the carburetter will sometimes get too hot. Then, and particularly with the former, they become difficult to manage; but a little extra oil or a little longer run will generally set matters right. Both carburetter and superheater should, however, be carefully watched by the operator, or the bricks, particularly in the former, may be fused and clinkered up, to the detriment of the whole plant.

During the past winter, the writer has had a good deal of trouble with the gas-valves connecting the generator and carburetter. These are of the water-cooled type; but they were soon put out of action so far as water cooling was concerned. The water in use contained a large amount of lime, and the passages consequently gradually got clogged up; and though many attempts were made, it finally became impossible to clear them. They continued for some time to do very good work, and the top valve is still in use. The bottom one, however, was found to be passing steam to the carburetter direct, to the detriment of the carbonizing results; and it was some weeks before it could be replaced. The top valve is in a somewhat similar condition; but as only two down-runs are required in every hour, it is of no great importance, and the valve will be replaced when the plant is thrown out of use for general repairs.

As has been pointed out, the writer's generating plant has not yet been duplicated, so that he has had to be very cautious not to so interfere with the plant as to cause a stoppage at a time and during a period when such stoppage meant a shortage in the supply of gas to the town.

Probably the weakest part of the whole of these water-gas plants lies in the stack-valves. It seems impossible to get thoroughly tight valves; and if these are not kept clean, great opportunities for waste occur. No engineer cares to see smoke escaping from his retort-lids; and the water-gas maker looks very jealously at the gas which, unfortunately, will escape, more or less, at the stack-valve. The object should be, therefore, to see that the stack-pipe leading to the washer is kept as free from carbon as possible, and so ease the superheater and plant generally of undue pressure, as well as to attend to, and clean, the stack-valve itself as frequently as possible.

Some little time after starting the plant at Gravesend, considerable trouble was experienced with the circulating pumps. The continual pumping of the hot liquor from the separator to the washer, in a very short time, destroyed the piston-rings, valves, rods, &c., of the pump. This was of the duplex type, and an admirable pump for other purposes. The valves, seatings, rods, &c., were of gun metal, and soon became eaten away. These were replaced with iron and steel; but they, in their turn, soon became in the same condition. Other means to overcome the difficulties were fruitlessly adopted, until at last the pump was thrown out of use, and a ram pump procured and put to work. Since then little or no trouble has been experienced.

Up to July of last year, all the tar produced in the carburetted water gas plant was used as boiler fuel. The boilers are fitted with Wilton's furnaces. A good deal of vibration was set up in the furnaces in burning the tar; and the writer, having reason to think that this vibration was doing the boilers no good, discontinued the practice. All the tar is now collected, and run into the relief holder tank as a storage-tank for future disposal.

The ebullition set up in the washer (which practically acts as a seal-pot) from the large volume of gas produced, necessitates continual pumping of water into it during the time the plant is at work. It is customary to use for this purpose the separator liquor, which in time becomes very hot. The writer has discarded the system, and now pumps direct from the relief holder tank to the washer, returning the liquid through a 3-inch wrought-iron pipe direct to the tank again. Eventually the present tar and water separator will be dispensed with, and the condenser and scrubber liquids conveyed direct to the gasholder tank. The altered system has a tendency to cool the gases and assist the condensers. The writer at first feared that loss of illuminating power would follow; but results do not appear to prove this.

There are one or two matters connected with a water-gas plant which the writer would impress upon those who are contemplating an installation. See that the scrubbers and condensers are of ample size, and something over. Then, as to the carburetter and superheater, too much attention cannot be given, or care taken, to see the arches and brick chequerwork properly built, spaced, and gauged. Doubtless the makers of the plant will see to this in the first place during its erection; but they should not be always on the premises. The brickwork in both superheater and carburetter should be taken out and rebuilt at least once in twelve months.

It is not the intention of the writer to go into details as to the relative costs of the manufacture of coal gas and water gas at Gravesend. With him it is not a question of which, under the best carbonizing circumstances, is the cheaper gas to produce. He has to deal with matters as they are; and he is convinced, from past experience, that the cost into the holder of the mixed gases of the illuminating power required—viz., 15½ candles—could not be produced with his existing coal-gas plant alone at the price at which it is being done. It may be interesting, however, to give the general results of the year ending June 24, 1906.

It should be first stated that the existing retort-house contains 19 benches of seven retorts each, 9 feet long and 15 in. by 21 in. diameter, Ω-shape. These are direct-fired, and only a small attempt can be made at regeneration. The retorts are shovel-charged; the house not being wide enough to work a scoop. The heats are invariably good, and 5200 cubic feet per mouthpiece are obtained on an average. In the depth of winter, however, before the advent of the carburetted water gas plant, owing to the drafting in of extra stokers, &c., this make would be considerably reduced—the men being mostly new to the work; and by the time they would have become used to it, they would, of course, have been gradually taken out of the house and withdrawn. The maximum number of men employed in the retort-house in the mid-winter of 1900-1 was 24 stokers and 6 coke wheelers—a total of 30 men—and the highest day's production was 622,000 cubic feet; whereas last winter the maximum day's make of gas reached 674,000 cubic feet, with 18 men on the coal-gas plant and 6 on the carburetted water gas plant. Here there is a large saving in labour alone, to say nothing of the wear and tear of plant.

The following results are taken from the annual accounts for the year ending June, 1906:—

| | Cubic Feet. |
|---|---|
| Coal gas made | 94,765,000 |
| Carburetted water gas made | 50,229,000 |
| Total | 144,994,000 |
| Gas made per ton of coal | 10,400 cub. ft. |
| Oil used per 1000 cubic feet of gas made | 3·49 gallons. |
| Average illuminating power— | |
| Coal gas | 13·75 candles. |
| Carburetted water gas | 20·00 ,, |
| Proportion of carburetted water gas in mixed gas | 34·6 per cent. |
| Average illuminating power supplied | 15·6 candles. |
| Coke used in the carburetted water-gas plant, including boiler fuel, per 1000 feet gas made | 60 lbs. |
| Average cost of mixed gas in holders, per 1000 feet. | 16·5d. |

There is nothing calling for special attention in these figures, excepting, perhaps, that the quantity of oil used may be somewhat large; and efforts are being made to reduce it. The boiler fuel is high also—averaging about 17 lbs. per 1000 cubic feet of gas made. The writer would point out, however, that all the necessary steam-pumps are run from the generating boilers, as is also the sulphate plant. Added to this, difficulties arose with the feed-water heater; and for a long period cold water was served to the boilers. The writer is quite satisfied that but for the carburetted water gas plant the cost of the gas in the holders, if produced solely from the coal-gas plant, as at present established, would be increased by quite 1½d. per 1000 cubic feet.

Before manufacturing carburetted water gas, it was usual to have a large quantity of coke for wholesale disposal at, for Gravesend, exceedingly low prices. Since the plant has been in use, there has been none for disposal in this way; and prices have in consequence been kept well up. At present, 18s. per ton is obtained on the works; and this will shortly be raised to 20s.

The writer will not be expected to deal with the carbon monoxide bogey, though his electrical friends in Gravesend raise it now and again, though somewhat timidly. Personally, he has had no difficulty, so far as cooking-stoves or gas-fires are concerned, though 50 per cent. of carburetted water gas has occasionally been sent out. Careful regulation of the burners at the time of fixing will prevent, to a large extent, any complaints.

It has been suggested that the probable reason for not extending the use of carburetted water gas lies in the fact that nothing has yet been done by the Board of Trade in regard to its own departmental report upon the subject, limiting the amount of carbon monoxide in the gas sent out. But this may prove a larger bogey than the other. True, departmental wheels grind slowly, but not, nevertheless, surely; and from the foundation and hold that carburetted water gas has now got in our own country it will be difficult to displace it.

The total cost of the Gravesend installation amounts to £7550, made up as follows:—

| | |
|---|---|
| Buildings, including sulphate house, store, and chimney shaft | £1783 |
| Water-gas plant complete, including condenser, scrubber, oil-tank, lift, staging, engines and exhausters, blower and blower-engines, boilers, pumps, &c. | 3664 |
| Mains, connections to gasholder, exhausters, purifiers, and meters, including all foundations for plant | 785 |
| Purifiers (four), 16 feet square by 5 feet deep, complete, with centre-valve and all connections | 895 |
| Station meter and connections | 363 |
| Photometer-house and contents | 60 |

*Discussion.*

The PRESIDENT thought the members would all agree that they had had a most interesting paper; and he hoped the discussion would be full and free.

Mr. J. T. JOLLIFFE (Ipswich), invited by the President to open the discussion, said he knew so little of the actual working of the carburetted water-gas plant at Ipswich from day to day, that he was not in a position to go into generalities. Mr. Prentice might perhaps be able to do that more fully. But he (Mr. Jolliffe) would like to say that, from their experience at Ipswich, they would not be without their water-gas plant. Their indebtedness to it was considerable. The comfort it gave to everybody concerned with the management of the works was so great, and the advantage of being able to control the coke and coal market was so large, that, without any question of economy or cheapness, he thought

the introduction of such a plant was justified. Further, he was perfectly sure that in Ipswich at all events they could make coal gas considerably cheaper because they had a water-gas plant to fall back upon, inasmuch as it enabled them to work their coal-gas retort-house to the best possible advantage.

Mr. FRANK PRENTICE (Ipswich) said it was rather a relief to hear a paper about gas-works matters which did not contain some phenomenal results, which some people found it exceedingly difficult to obtain. It seemed to him that in the paper they had just heard read they had an account of the work of a man, in an ordinary works, trying to overcome the difficulties which presented themselves, and the results he had attained he had not painted in too high colours. In considering the paper, it would be interesting to know at what price Mr. Davis charged his coke against the water-gas plant. He sold coke at 18s. to 20s. Did he charge 18s. to 20s. for coke used in the plant? The amount of oil employed per 1000 cubic feet for the production of 20-candle gas seemed to him rather high; and he should like to know how this 20-candle quality was arrived at. Was it by using the No. 2 "Metropolitan" burner, a special water-gas burner, or the No. 1 "London" argand? At Ipswich, they had to deal with the No. 1 "London" argand; and very greatly to their detriment. With regard to the coke, there appeared to be some difficulty in Mr. Davis's experience, in using coke from Durham coal. At Ipswich, they used nearly always Durham coal—Londonderry and Boldon. They found the coke from the Londonderry coal excellent for generating purposes; and they did not find any clinker that could not be easily got out. They clinkered once, about every eight hours. If they ran for any considerable time on the coke produced from Boldon coal, the clinkering was a rather more serious job.

Mr. W. D. CHILD (Romford) said in the works under his charge, they only used their carburetted water-gas plant as an auxiliary, working it for eight hours a day. In consequence, the results obtained from the plant would not compare quite favourably with those realized from plants used continuously, because each day they had to heat up the plant to the proper degree of working heat; so that the quantity of coke used per 1000 cubic feet and other items were increased in their intermittent working. But he was perfectly convinced the combined gas was cheaper than coal gas alone, owing to the assistance rendered by the carburetted water-gas plant. The plant, among other things, enabled a gas manager to delay the lighting-up of a further bed of retorts or bringing further labour into his retort-house until the bed and the labour could be fully employed. When their requirements necessitated, all they had to do was to produce a little more water gas, until they could find sufficient employment for the additional retorts and men. He had taken out the figures as to costs year by year; and they invariably showed that the manufacture of coal gas was slightly below the manufacture of the carburetted water gas. But one must bear in mind that the coal gas was so largely helped by the use of the carburetted water gas that some credit ought to be given to the latter. He found, on looking at some of his old papers, that in December, 1903, he made a note to the effect that he considered the value of the coke sold from the works was increased by 2s. 3d. per ton, by the fact of the restriction the plant put on the quantity they had to offer for sale; so that a considerable sum should have been added to the benefit of the carburetted water-gas plant. Many of these points it was very difficult to show by figures, but they impressed on those who had charge of works that they were doing the right thing in engaging in the manufacture of carburetted water-gas—for cheapening the cost of production, for retaining a hold upon labour, and for having complete control of the illuminating value of the gas sent out to the district. He was surprised to see the quantity of oil Mr. Davis found it necessary to use for making 20-candle gas; and he thought many others would be surprised with him that it was considered necessary to make 20-candle gas in these days of the Welsbach mantle. Equally good results might be obtained for the consumer by a gas of much lower value, and the quantity of oil used might easily be reduced. He considered that there was at least a gallon of oil used more than was necessary.

Mr. DAVIS remarked that the gas distributed was 20-candle carburetted water gas and 13½-candle coal gas, mixed.

Mr. CHILD said Mr. Davis made 20-candle water gas; and it worked out to about 5·6 candles per gallon. In reference to the quantity of coke used per 1000 feet of gas, the author's method of stating it was that adopted by the manufacturers of water-gas plant; and he did not think it was fair, either to those who were contemplating adopting water-gas plant or to those using it. Mr. Davis had evidently omitted from the figure the quantity of coke used in his steam-boilers.

Mr. DAVIS said the figure was for the whole of the plant. He mentioned in the paper "including boiler fuel."

Mr. CHILD said, in the hurry of looking at the figures, he had missed that. However, the figure slightly exceeded anything he did himself. His highest at Romford had been 52 or 53 lbs. per 1000 cubic feet. He mentioned this point because it was a method of stating the coke consumption which was tried by the makers of water-gas plant; and, in fact, it operated in his own case very largely in inducing the adoption of a plant. He was considerably disappointed after working the plant, to find the question of the coke used for boiler purposes had been entirely omitted from the figures put before him.

Mr. JOHN YOUNG (Hull) said the paper was an interesting one, and was a fair account of the difficulties met with, and the overcoming of those difficulties, by Mr. Davis. There were two or three points to which he (Mr. Young) might just refer. One was the low efficiency obtained from the oil used. That, however, was perhaps hardly a fair point for criticism, because the number of oils on the market were varied, and of varied value; and Mr. Davis might be getting the best value from the particular oil he was using. Most gas engineers who were making carburetted water gas were aiming at 7 candles per gallon; and some had the good fortune to obtain it. In the actual working of the plant, Mr. Davis spoke of the wisdom of renewing the brickwork in the carburetter and superheater at stated intervals, and there he (Mr. Young) quite agreed with him, excepting that, in the carburetter, he thought he would find he would obtain better results by emptying the carburetter at least every three months. The hydrocarbon had a peculiar action on the chequer brickwork. When once the bricks were saturated with the hydrocarbon, a thin skin of charred matter formed on the outer surface of the brickwork, and that was a very poor conductor of heat. The man attending to the plant, or the engineer looking at it, saw a comparatively hot carburetter during the blow. But when the run was on, the amount of heat actually held by the brickwork was simply superficial; and the carburetter was cooled much more rapidly than the attendant or the engineer expected, and the results were not so good. He thought the carburetter bricks should be taken out at least once every three months. The system of using up some of the better looking of the old carburetter bricks should also be condemned, as the results of so doing were not at all satisfactory. He thought Mr. Davis was trying a dangerous experiment in putting the oil tar into the relief holder tank; and he hoped he would be able to get rid of it in a much better way shortly. One difficulty in selling oil tar was the water; and if the tar could be produced practically free from water, there would be no difficulty in getting a ready sale. The best method of getting oil tar free from water was to keep the separator as hot as possible, with as slow a flow of water through it as could be obtained. Most of the water-gas plant makers, in his opinion, had been too economical in their condensing and scrubbing arrangements. It would pay some of them to add to their condensing power, and use only cold water in the scrubber and washer, and as little of it as possible, in order that the stream through the saturator should be as hot and move as slowly as they could really afford to have it, so that the oil tar could be pumped out practically free from water. They had a very strict tar buyer at Hull; and he had never had occasion to complain once. He (Mr. Young) attributed this almost entirely to the fact that they had their separator built in a puddle soil; and therefore the heat was retained much better than it would be in the ordinary steel tank put in by most manufacturers. Another danger in connection with the putting of oil tar in the relief gasholder tank was this: Before very long Mr. Davis would have displaced the whole of the water there, and the contact with the oil tar of the newly made carburetted water gas would rob the latter of a considerable amount of its light-giving hydrocarbons.

Mr. T. GLOVER (Norwich) said, in Mr. Young's contribution to the discussion, he had given the members some very valuable information with regard to oil tar. His (Mr. Glover's) own experience agreed with that of the author as to the difficulty of recirculating the liquor to the scrubber and the effect of the weak acids on the pumps. And, strange to say, he had found relief in exactly the same way as the author, by displacing the duplex pump by a ram pump; and since then he had had no trouble. His experience differed from Mr. Young, in that he (Mr. Glover) thought it was a good thing to recirculate the water from the separator to the scrubber while it was hot, and not to introduce fresh water into the scrubber. When once the water was saturated with the hydrocarbons, it was as well to re-use it. They did not want to purify the crude water gas with fresh water, but to use it mechanically for separating the tarry particles from the crude gas; and for this purpose he thought the saturated water itself would answer better than fresh water. In regard to clinker creeping up the sides of the generator, his experience tallied with that of Mr. Davis, particularly with the coke from some Durham coals; and the difficulty was a very real one. When they were depending upon a plant for a given production of gas, and the clinker crept up and arched over, and left a 2 feet opening in the generator, instead of 6 feet, it could readily be understood that the difficulty was serious; and so one had to use coke which would not bring about this result—coke that would give a reliable production, and not build up clinker. In regard to the 5·73 candles per gallon of oil used which the author spoke about, it did seem low; but this depended, he (Mr. Glover) supposed, somewhat on the method of purification, and also, as Mr. Prentice had mentioned, on the burner used for testing. The "London" argand burner was not suited for testing water gas. The air supply, as they all knew, was altogether wrong to develop the illuminating power. The air required for carburetted water gas was much less than for coal gas. The burner was made for 16-candle coal gas; and not for the testing of water gas. He knew that the makers of carburetted water gas used to claim that they could get 8 candles per gallon of oil. That was altogether misleading. It might be done in a test with everything extremely favourable, supplemented by a little bit of imagination; but it never was realized in practice. They ought to get, as Mr. Young said, about 7 candles per gallon. Most of them did, as a matter of fact, get pretty near that; and if the carbonic acid was left in,

he supposed that such a result was not very bad. The carbonic acid was one of the controlling factors, and one of the things which had to be tested for frequently. If it ran up, and got beyond 4 per cent., then they knew it pulled down the illuminating power very considerably. They ought to try to work so as to keep well within 4 per cent. Something might be done to improve the water gas in regulating the steam supply to the generator in accordance with the condition of the coke in the generator. His impression was that sufficient attention had not been given to this point. The generator was in its best condition when the coke was in its highest state of incandescence; and it would then stand a free flow of steam through it. But it should be regulated as the generator lost its heat. That was a direction in which he had been working lately with good results. He agreed also with Mr. Davis's practice in shutting off the oil a minute or a minute-and-a-half before the blow. It cleared the plant of hydrocarbon vapours, and allowed the plant to work without nuisance.

Mr. F. J. ANGELL (Messrs. Humphreys and Glasgow) said he had listened to Mr. Davis's paper with great pleasure; but he had no criticisms to offer upon it. There were one or two points which the author had mentioned, and which were extremely important when one was considering the question of the manufacture of carburetted water gas; and these points perhaps had not been discussed with the fullness their importance deserved. Mr. Davis had alluded to the usefulness of water-gas plant (and this had been emphasized by Mr. Child) in taking up what was called the peak-load of gas consumption. When this was borne by the retort-house, it meant that extra retorts had to be heated up, and kept under fire during the winter time, both for the sake of emergency, and, for short times, for taking up the increased consumption during mid-winter. The labour and fuel expended in bringing these retorts into use, and holding them in suspense, meant loss. Then there was the loss both in the yield of gas and illuminating power pending the time the extra retorts were settling down to work; and upon that were the extra repairs involved in the working of the retorts. These things all formed an expensive load upon the coal-gas working. If this could be taken off, the remaining coal gas was materially cheapened. On the other hand, carburetted water-gas plant was essentially suited for this kind of work. It could be lighted up from cold, and it could be put out of action in 30 seconds, without any structural damage. For this work, water-gas plant was almost always cheaper than coal gas; so that for every undertaking of any size, there was considerable economy to be obtained by meeting this part of the year's work with a carburetted water-gas plant. This was one of the reflex advantages of water-gas working. Take another subject—the so-called collateral advantages. Mr. Davis had emphasized the relief in his coke sales by the use of his water-gas plant. He said that all the coke that used to be sacrificed at wholesale prices was now either used in the water-gas plant or was sold locally at enhanced prices. It would be interesting if he could tell them how much his coke prices had been increased in this way. A further point, which was very important indeed, was where Mr. Davis said that he put in water-gas plant in place either of building another retort-house, or remodelling the old works; and this pointed to the possibilities of savings in capital expenditure and interest. Interest was just as much a part of the saving on the manufacture of gas as coke or oil. Then there was also the wear and tear involved on the plant. The magnitude of these savings on interest and repairs and maintenance ran up so much that it could be shown very often that the joint gas leaving the works did not actually cost so much as the coal gas alone, so that this could be regarded as a direct saving to the undertaking in question.

Mr. B. B. WALLER (Economical Gas Apparatus Construction Company, Limited) congratulated Mr. Davis on the fair-mindedness and honesty of the paper. He had set forth, in a straightforward manner, the difficulties he had had, the way he had overcome them, and the advantages he had found from the use of his plant. He (Mr. Waller) thought perhaps the keynote of the paper might be summed up, with regard to the working of the water-gas plant, in keeping it in good condition, having a good man to work it, and paying the man well. It was not the slightest good putting a stoker to work a water-gas plant, and think that good results could be obtained from it. They must have a good man, and a man who could command fair wages; and, under such conditions, they could expect to obtain good results. Respecting the renewal of the chequer brickwork, it was false economy to allow the work to remain too long in the plant without renewal; and the remarks that Mr. Young had made on this point showed clearly the necessity from time to time—in some cases sooner, others longer, according to the way the plant was worked—of renewing it. The brickwork would not last for ever; and it worked better when new than when old. A happy medium was the principle to be followed in deciding upon this point. As to the oil results, the average Mr. Davis had given was certainly a little below, in excellence, what was usual; but he thought Mr. Davis would be able to give them some information as to the class of oil he had been using. He believed he had been trying first one sort and then another. And as the oil market was at the present time, they hardly knew what kind of oil they were using. This would partly account for the oil results. The illuminating power test applied was also a very important one; and it admitted quite a large latitude in the efficiency of the oil results obtained.

The PRESIDENT said they had had a full and free discussion. His experience was not quite the same as that of the writer of the paper, and of the gentlemen who had discussed it. As the members were aware, he was working at Cleethorpes with blue-water gas. Speaking generally, he could fully and strongly endorse all that had been said respecting the all-round economy, and perhaps he should say the flexibility and utility of water-gas plant as an auxiliary to coal-gas plant. Any members who had to consider the question of further retort power, if they were wise, would look into this question of water-gas plant, instead of spending a large amount of money putting up a new retort-house. It would stave off capital expenditure for a considerable time. With regard to illuminating power, working simply blue-water gas, his experience was that it was not so much the question of 15 or 16 or any other candle power as that of uniform quality and uniform pressure that had to be observed. They would have less complaints by sending out a uniform quality of even 14-candle gas than if they varied the illuminating power from (say) 16 to 18 candles. He distributed as near as possible 14½-candle gas tested by the ordinary standard photometer; and he never—not once in six months—received a complaint of poor gas, simply because the consumers adapted their burners to it, and in this way got used to gas of one uniform quality.

Mr. DAVIS, replying to the discussion, thanked the members for the courtesy they had shown, and the cordial way in which they had discussed the paper. It was, he said, difficult to answer many of the questions, because the paper was not intended to deal with the subject of "Water-Gas Plant *v.* Coal-Gas Plant," but rather to treat of the question of water-gas plant as he had installed it. He agreed with every word Mr. Jolliffe had said. Mr. Prentice asked him at what price he was charging the coke to the water-gas plant. He used 50 per cent. of coke and 50 per cent. of breeze; and, as near as he could possibly get it, it was charged at 12s. 6d. per ton, which made the coke about 16s. per ton. Various members had spoken about the quantity of oil used, and said it was high. He knew that it was. But it must be remembered that this was a case of oxide purification only. There was no attempt made to take out the carbonic acid in the gas that had been caused by the formation of clinker in the carburetter, or by something having gone wrong with the steam jets; and the illuminating power had then been brought up with a little more oil. That was where the leakage, if he might so term it, had taken place. He might mention that for the last fortnight or three weeks, for some reason or other, the consumption of oil had been about 3 gallons per 1000 cubic feet. But until the generator was thoroughly cleared out, he had not been able to keep down to that. He should very much like to test on his own photometer the gas where 7 or 8 gallons were used. His method of testing was simply a Methven screen against a No. 1 "London" argand burner. He did not use anything else—simply the same burner that was employed on the ordinary photometer. Mr. Prentice said that he found very little clinker in his generator. Probably Mr. Prentice was using coke from the best Londonderry coal. He (Mr. Davis) could not afford to use that coal at Gravesend; he had to put up with what he could get. With reference to Mr. Child's remarks, he thought he agreed with everything that was stated in the paper. As to the boiler fuel, all sorts of statements were made about it. He remembered not long ago at the meeting of one Association, that boiler fuel was put at 7 lbs. per 1000 cubic feet of gas. He showed 17 lbs.; and then he had to add to that the tar he had been making. Up to July last year, the 17 lbs. was *plus* the tar. When he was not using tar, the boiler fuel came to 20 lbs. per 1000 cubic feet; and he said again it could not be done for less, if they were finding steam for the whole of the plant—sulphate plant included. Mr. Young's arguments were very sound; but he was dealing with a plant erected in duplicate. To put new brickwork in the superheater every three months would be impossible in his own case. His plant had been worked from the last week in September to the first week in July. For five months at any rate during that period it was working night and day; the only stoppage being for clinkering—say, two hours a day. If he had his plant in duplicate, it would be another matter, and it was possible he might raise his oil up to 7 candles per gallon. As to the question of carrying the oil tar into the relief holder, the tank was 80 feet in diameter and 20 feet deep; so it would take a long time to fill it. The tank, too, was 5 feet above ground level; and therefore he could syphon out the tar. Possibly, if he pumped it out, he would take some water with it. Up to the present, he had not attempted to sell the tar. He had difficulty with the tar contractors some time ago; they being afraid that he was putting water-gas tar into the ordinary tar. With reference to the illuminating power, he thought he might possibly lose something in that direction by pumping cold water into the washer and sending it back again into the holder. But he had been careful in his testings. All of them were carried out in an exactly identical manner; and he had found the results were much about the same. As to the remarks of Mr. Angell and Mr. Waller, he (Mr. Davis) had not gone into the *pros* and *cons* of the cost on either one plant or the other—water gas or coal gas. If he had had to build a new retort-house to turn out the same amount of gas—50 millions—it would have cost him more than £10,000. The President said that 14-candle gas without variation in quality was quite good enough. But the Corporation of Gravesend said 15 candles was the standard there, and that they would have it; and they tested the gas occasionally at the Town Hall to see that they did get it.

Mr. W. H. MAINWARING (Lincoln) then read a paper, entitled

## LINCOLN GAS UNDERTAKING: TWENTY YEARS OF MUNICIPAL CONTROL.

The practical development of gas lighting in this country was little more than ten years old when its first installation took place in Lincoln. It was in 1817 that Mr. Page Cartledge, a grocer in business within a yard or two of the Guildhall, introduced gas into his shop. He manufactured it on his own premises; and apparently he was satisfied with his experience of the new illuminant, for we find him later taking an active part in the promotion of a gas company, formed in 1828, to supply the city, which at this date had a population of about 11,000, and presented no indication of the industrial development which was in course of time to manifest itself. A capital of £8000 was authorized, and, in addition, a loan of £2000—soon afterwards repaid. The town was first lighted with gas in 1829; and in 1830 mills and factories were supplied by meter at 13s. 6d. per 1000 cubic feet.

For the long period of forty-five years, no further capital was issued, until, in 1873, it became apparent that large extensions were necessary, and application was made to Parliament. Besides the ordinary capital raised at that date, the Company asked for power to issue £70,000 of stock, to be divided *pro ratâ* among the shareholders as compensation for the loss of interest they had sustained on account of the payment for so many years for all extensions out of revenue. The Corporation of that day opposed this; and it was finally agreed that £36,500 would equitably represent the amount to which the shareholders were entitled. With part of the capital obtained at that time new works at Bracebridge were erected.

There were two attempts on the part of the Corporation to acquire the Gas Company's property. The first poll of the town proved adverse to the purchase, as it was taken at a period when, according to the opponents of the scheme, gas was on the point of being extinguished by the rising tide of electricity. A year or two later the question was reopened—this time with more success; and in 1884 negotiations were commenced which resulted in the transfer of the undertaking to the citizens, on the basis of 25 years' purchase of the maximum dividends.

The healthy progress of the Gas Department since it has been under Corporation control is evident from the following figures. The make of gas has increased from 160 million cubic feet to 355 millions; the number of consumers from 5800 to 10,750; and the mileage of mains from 36 to 58. The cost of the whole of the extensions necessary to cope with this increased business has been entirely provided out of surplus profits, after payment of interest on the capital and the contribution to sinking fund. Besides the necessary additions to works, mains, meters, &c., the following are the principal items of expenditure, all of which would, under a company, be most legitimately charged to the capital account: £8000 has been spent on cooking stoves, £1000 on a sulphate of ammonia plant, £2000 on railway waggons, £14,000 on a carburetted water-gas section, and an installation of De Brouwer stoking and coal-handling machinery is now approaching completion at a cost of nearly £4000.

During the entire period of twenty years there has been no additional issue of capital whatever; and, moreover, by the operation of the sinking fund, 25 per cent. of the amount outstanding has been paid off. In 1887, the capital per 1000 cubic feet of gas sold was £1 5s. 9d.; it is now 8s. 11d. It should be clearly understood that this desirable condition has not been attained by unduly penalizing the present generation of consumers for the benefit of their successors. To prove this, it is only necessary to say that the Corporation have steadily reduced the price of gas to the present charge of 1s. 11d. and 2s. 1d. per 1000 cubic feet, and have also abolished all charge for meters. The working conditions and pay of the employees are considerably improved; stokers' wages having increased from 32s. to 41s. 3d. per week. In addition to this, the general district rate has benefited to the extent of more than £20,000; and it may be said, in defence of what is to many a somewhat questionable disposal of surplus profit, that in very few towns does the proportion of gas consumers to ratepayers approach more nearly to what it should be—an equality. To make assurance doubly sure, and as a guarantee that the undertaking for which they are responsible should be in a position to withstand any sudden or extraordinary demand upon it, the Gas Committee were not long before they established a reserve fund, which now amounts to £13,500. There can be no question that the financial stability and commercial success of this branch of local municipal enterprise is very largely due to the consistency of the policy pursued by the Gas Committee, especially with reference to the reduction of the capital debt. This has been rendered easier by the fact that the two Chairmen who have directed its operations were both of them gentlemen of large commercial experience, who have, notwithstanding the alleged "impossibility" of such an achievement, bestowed a really personal interest in the management of the undertaking.

This occasion emboldens me—and I believe the record I have submitted justifies me—in raising a question which must possess considerable personal interest for more than myself, and placing before you to-day my views in regard to it. It is the vogue at the present time to decry with freedom every manifestation of civic enterprise—indeed, some of the objections are difficult to understand in a country such as ours, which has gone through so many struggles to obtain and retain the control of its finances for its representative assembly. The general question as to whether local authorities ought to embark in reproductive undertakings is not one to be legitimately introduced before you. But I hope no one present will resent an attempt to demonstrate that the administration of municipal gas supply has been unwarrantably impeached, and defrauded of the credit due to it, by experts and statisticians who might be expected to produce something more than mere assertions, certainly not supported by the facts at their disposal.

As an example of the sort of criticism to which I refer, I ask you to allow me to read from a report of a speech by Lord Avebury before the Industrial Freedom League in July last:

> Of course, he said, when municipalities had monopolies it was very easy to make a profit on paper. All they had to do was to take what they chose out of the pockets of the ratepayers, and call it profit. But he doubted if a profit had ever been made except with a monopoly. Those of them who were engaged in practical business knew that the profits depended upon close attention to details, on watching the turn of the market, and on giving mind and thought to the business. This was quite impossible for the members of a municipality, who had so many other things to attend to; and consequently municipal management could not be so profitable or successful as private management.

In a review of his latest work on this subject, Lord Avebury is quoted as writing—in reference to gas supply more particularly—

> That profits are only made, if at all, when municipalities have a monopoly (they are confined to business such as the manufacture of gas, which has long been established and reduced to regular rules); that even in such cases the accounts have been so kept as to make it impossible to determine what the real result has been; that the profit, if any, has been but small; and that much more satisfactory and remunerative results might have been obtained if the works had been leased to private companies or firms.

It is perhaps hardly worth while to notice the minor light diffused by Mr. J. Holt Schooling, unless to illustrate the manner in which the subject is dished-up for popular consumption. In a magazine article, this gentleman proves to his own satisfaction that the gas-works belonging to local authorities as a whole are worked at a yearly loss of £3 0s. 6d. per £100 of capital. Gas undertakings are included in the following sweeping summary:

> Some of these undertakings are stated by municipal corporations to be worked at a profit and some at a loss. But as the amount set apart by corporations for depreciation of plant, machinery, buildings, &c., is merely trivial, all these undertakings are worked at a yearly loss.

The fundamental objection to municipal trading seems to be based upon the amount of municipal debt incurred, and the increase of rates consequent thereon; but this objection cannot be maintained when applied to the capital sunk in municipal gas supply. There can be no question that, so far as gas undertakings of local authorities are concerned, the debt created on their behalf is obviously identical with the capital of a gas company, and the security is at least as good in the one case as in the other. As for increased rates, I need hardly say that if it were not for subsidies from the surplus created by the gas consumers, rates would, in many instances, be even higher than they are at present. It is, of course, a truism to state that in the event of financial loss, the balance is adjusted, not by appealing to the rates for assistance, but by an increase in the price charged for gas consumed, precisely in the same manner as it would be if the concern were managed by a private company.

Much stress is laid on the benefit conferred by monopoly, which, it is alleged, is the predominant factor in profitable municipal management. The question of monopoly does not, however, really enter into this argument at all. I do not admit for one moment that where the gas-works are owned by the ratepayers undue advantage is taken of this privilege, or that a comparison between the charges of each class of undertaking would justify the insinuation that such is the case.

We can agree most completely with at least one of his lordship's statements—that the profits arising out of the management of any business are contingent upon its being conducted with a due regard to the observance of prudent commercial principles. But the inference drawn from this—that a gas committee are necessarily unable to apply these principles—is not so evident. I, for one, am not prepared to admit that those who are fortunate enough to obtain seats on a directorate are, as a class, of superior ability to those elected to serve on a corporation. In this country, at all events, we have not yet reached the stage where the least desirable candidate has the best chance of attaining municipal honour. On the contrary, I believe that the deliberations of a gas committee are as likely to be productive of sound business results as those of a board of directors—assuming they are equally fortunate in their technical adviser, and repose an equal confidence in his skill.

It is only the fear of instituting invidious comparisons which deters me from challenging more fully the dictum that it is impossible for municipal management to be as successful or profitable as private management. It is, perhaps, hardly necessary; for I should imagine that Lord Avebury's strictures, in so far as they are applicable to our own particular industry, are estimated at their true value by most of us. It is not easy to agree as to what may be deemed a fair criterion of successful working; but on whatever basis the comparison may be instituted, I can safely leave it to your own judgment to decide whether the record we can show does not prove that it is possible for municipal control to achieve both successful and profitable results. It would certainly be interesting and instructive to learn definitely in what direction we might expect the increased benefit to accrue to the

community if the gas supply were transferred to a company or leased to a private firm. So far as the citizens of Lincoln are concerned, I maintain that they would in every way be losers by the change. From a company, the benefit of the consumer could only expect to receive secondary consideration. Shareholders' dividends would have, not an equal, but a prior claim; and dissatisfaction would inevitably follow if they received no more substantial slice from the gross profit (varying as it varied) than is represented by the fixed and moderate rate of interest paid to holders of corporation stock as the market value of borrowed capital.

Under municipal management the whole of whatever profit there may be is secured by the consumer and the ratepayer; and it seems difficult to substantiate any better claim than theirs to it. The manner in which the accounts are kept cannot obliterate this solid advantage; at the most it can only obscure for a time the correct valuation of it. So far, then, as Lincoln is concerned, although there is no reason to infer that it occupies any special position, I claim that the asset we possess in the municipal gas undertaking of our city provides ample security, far exceeding any liability which the citizens have incurred by the responsibility of its possession.

I have said enough, I hope, to show that the Corporation have, in its administration, carried the principles of sound and prudent finance to the extreme; and I invite, with absolute confidence, the most exhaustive criticism that champions of private monopoly choose to apply.

*Discussion.*

Mr. R. G. SHADBOLT (Grantham) said that the challenge with which Mr. Mainwaring ended his paper was most inspiring. Just imagine it: "I have said enough, I hope, to show that the Corporation has, in its administration, carried the principles of sound and prudent finance to the extreme; and I invite, with absolute confidence, the most exhaustive criticism that champions of private monopoly choose to apply." How could they rise to that, when Mr. Mainwaring knew full well that he occupied a position he himself had chosen, which was there unassailable. Personally he (Mr. Shadbolt) could never see the difference in principle between the working of a gas undertaking owned by a local authority and the working of an undertaking owned by a company. Both of them must have capital to carry on their business; otherwise there would be no undertaking at all. Although, as was pointed out by the author, there might be instances where the dividend of the shareholder was the first or primary consideration, so also was the interest to those who advanced money to a corporation on loan. Let the corporation fail to pay the interest, and see what the result would be. That was their first consideration; and in conjunction with it was the duty they had to perform to the consumers. This applied to the company in exactly the same way. So far as the gas industry went, the opinion of the public generally was that the profits of a gas company were equal (say) to 7 per cent., which they would continue to draw whatever happened; but in the case of a Corporation, unless there was a surplus over and above the interest it was said there was no profit. What was called profit in the one case was the dividend; what was called profit in the other case was the surplus over and above the interest. He hoped in the interests of the gas consumers of Lincoln the discussion of this subject would have some effect, and that, low as the price of gas was now, it might be made still lower by the civic authorities recognizing that the gas undertaking was of such a nature that it was sufficient security in itself to guarantee the demands of interest and sinking fund for practically all time to come without fear of any demand being made upon the rates. Lincoln was almost unique. It was one of the very few places where the number of gas consumers and the number of ratepayers were practically identical; and so to hand the gas surplus over to the rates, was only robbing Peter to pay Paul, and Peter and Paul in this instance were one and the same individual. In some places, this was not so. But the paper raised a question that one could discuss *ad infinitum*.

Mr. C. F. RUGGLES (Leighton Buzzard) thought it would be well if the paper was published in the local press, so that the ratepayers of Lincoln might see the excellent work that was being done by the Corporation Gas Committee.

Mr. JOHN CARTER (Lincoln) said, in view of the persistent attacks that had been levelled in recent years not merely against municipal trading generally, but against their own particular branch of corporation activity, the paper was of interest not only to local readers but to others. Bearing in mind the fact that corporation gas-works represented one-half of the total capital involved in gas undertakings outside the Metropolis, he thought the time was opportune—perhaps it had been opportune before now—for some reply to be made to the persistent statements to which he referred, and which had been intended to prejudice these particular undertakings—statements made by men of the highest authority and character, and which proceeded simply out of the abundance of their ignorance or their prejudice. The attacks were chiefly made on three grounds. In the first place, it was said that a corporation committee, by some innate disability, were not as capable a body for the conduct of a gas business as a board of directors. Now he did not believe in conducting a controversy of this sort by instituting any invidious comparisons between one class and another. His own opinion was that, taking the directors of gas companies generally, and taking the members of corporation gas committees generally, it would be found they were largely drawn from the same class of individual, and they were in both cases constituted of men of great commercial experience—men who had made a success of their own businesses, and so all the more capable of making a success of the businesses the public might entrust to their hands. He ventured to think the President at any rate would never subscribe to the doctrine that a man who was a capable business man in the board room of a gas company lost all his competence and capability as soon as he crossed the threshold of the council chamber. It was a doctrine he could never adopt; and the argument did not carry them very far in the controversy directed against municipal enterprise as particularly affecting the gas industry. Lord Avebury had published a great deal that was most interesting and instructive; and he had also published a great deal that was neither the one nor the other. He told them that the public could be better served by a board of directors than they could possibly be by a corporation committee. If "be better served" meant anything at all, it meant that the public could buy their gas at a lower rate from the one than from the other. Statistics were available which showed that gas had been sold in this country at, on an average, a cheaper rate by corporation committees. If that was not the case, then the Board of Trade returns went to the wall. Then another charge against corporation committees was that, if they did make any profit at all, they did so at the expense of prudent principles of finance—by neglect of the proper charges which ought to be made against their revenue account for depreciation. He (Mr. Carter) argued from local facts. Up to 1885, the gas supply of Lincoln was in the hands of a Gas Company; and up to the latest moment of the existence of that Company, if the Directors had been so minded, if they had been willing to form a depreciation fund, the Gas-Works Clauses Act provided an absolutely unsurmountable obstacle. In later years, under the operation of the sliding-scale and a standard price, a great deal more freedom had been conferred upon gas companies; but if the law would not allow a gas company to form a depreciation fund, why should these gentlemen try to make it an offence on the part of corporations, if they did not do what a company could not do. They were both on the same lines. In the one case, it was a cardinal offence; in the other, it was conduct that was entirely overlooked. Go a step farther and look at the figures Mr. Mainwaring had given with regard to Lincoln. Had they not depreciated? Had not all the gas undertakings owned by corporations in the country depreciated? They might not have a fund which was called by that title. But the sinking fund formed a depreciation fund of an uncommonly effective character; and every year the capital value of corporation undertakings was by that means being enormously and judiciously, and at an accelerated pace, reduced. In Lincoln, they had since 1887 reduced their capital liability per 1000 cubic feet from 25s. 9d. to 8s. 11d.; and their capital charges for interest and sinking fund did not amount to more than about 5½d. per 1000 cubic feet of gas sold. In face of these figures from local experience, he would ask whether corporation undertakings did neglect sound and prudent finance. Any man who came forward with statements such as he had indicated must be oblivious to the significance of facts, or he must be so devoted to the interests of private monopoly that he refused to recognize what was clear, outstanding, and obvious, or else his mental condition must be that of a man hovering near the frontiers of imbecility.

Mr. JAMES RANDALL (Tottenham), called upon by the President, said there was only one thing he should like to point out that had not been spoken about. All that was said in favour of gas companies directing their own businesses and local authorities directing those of the public, hinged entirely on the point of honest dealing. But when they got men occupying houses at a rental of about 8s. a week, who were servants and whose occupations caused them to fairly frequently change their place of residence—they were no doubt men of capacity, and men who could govern, up to a point—then he could not hold out any encouragement for achieving such results as were achieved in Lincoln. If everywhere they could get such men for all local authorities as they had in Lincoln, then he should have no fear for the success of all gas undertakings carried on by municipalities. He was sure, from personal experience in other places, that much could be said on both sides of this question.

Mr. S. SHADBOLT (Kirkby-in-Ashfield) said as a manager of a municipal undertaking, he could not agree altogether with everything being in praise of municipal management and control of gas manufacture and distribution. It seemed unkind in that room to say anything against the paper, and the sentiments that were behind it, when they were accepting the hospitality of the Corporation of Lincoln. It had been said that there was nothing at all to show that a man whose privilege it was to accept a directorship was particularly qualified for the duties. The arguments cut just as much the other way. There was nothing in electing a man to serve on a municipal body that fitted him for serving a gas undertaking; and unfortunately there were not many Lincolns. To be a director, a man must have a certain amount of wealth; and wealth gave an opportunity for education. Some of them could point to samples of councils many of the members of which had not had the education necessary to qualify them for directing the affairs of any commercial enterprise. In many cases, too, the business of municipal undertakings was crippled by political bias. He held no brief for a lot of trodden

down gas managers. But he had seen something of this in cases where it was in plainer evidence than in his own district. In his district, they had colliery inhabitants; and the members could form some idea of the class of councils they got. It was very different from Lincoln. He did not think there was any great virtue in local authorities depreciating by sinking fund, because he did not think it was particularly virtuous for anyone to obey when he was compelled to do so. [Laughter.]

Mr. MAINWARING, in reply, said that so long as he had proved to his own satisfaction and that of the members that in Lincoln at any rate they managed their gas-works in such a way as to make them a paying concern, he could claim he had proved his case. All else was beside the question. Regarding the point as to downtrodden managers and the character of the councillors in some districts, they had, on the other hand, heard of such things as guinea-pigs; and, as they knew, the ordinary director of a business was not always a model of business training. With reference to Mr. Shadbolt's remarks as to the contribution to the rates, this practice was contrary entirely to what was his own idea. It seemed more just to pay what surplus they had to themselves, as ratepayers than to shareholders. He did not wish to make any comparisons with regard to the price, although he had worked this out, so far as he could do so from the "Gas World Analyses." He found that the price charged was 2¾d. less for the municipal authorities, on the average, taking only the 114 gas undertakings comprised in the tables.

### ELECTION OF OFFICE-BEARERS.

On the proposition of the PRESIDENT, seconded by Mr. J. S. DOUGALL (Boston), Mr. J. Davis, of Gravesend, was elected President for the ensuing year; and on the motion of Mr. CARTER, seconded by Mr. J. W. AUCHTERLONIE (Cambridge), Mr. C. F. Ruggles was elected to the Vice-Presidency.

Both Mr. DAVIS and Mr. RUGGLES made suitable acknowledgment of the honour conferred upon them.

Proposed by Mr. R. S. SHADBOLT, and seconded by Mr. FRANK PRENTICE, Mr. Guyatt was re-elected to the office of Hon. Secretary and Treasurer. His valuable work for the Association was commented upon.

Mr. GUYATT, in his acknowledgment, said he had thought of asking the members to find a successor; but he had now agreed to continue for another year if the members were pleased to reappoint him.

Moved by Mr. GLOVER, and seconded by Mr. TROUGHTON, Messrs. Wimhurst and Dann were appointed Auditors.

Mr. JOLLIFFE proposed, and Mr. CASTERTON seconded, the election of Mr. Mainwaring and Mr. Paternoster as members of the Committee; and this was also agreed to.

### PLACE OF NEXT MEETING.

The PRESIDENT-ELECT proposed that the next place of meeting be Gravesend. His Directors, he said, would be very pleased if the members would accept the invitation.

Mr. MAINWARING seconded the motion; remarking that it was very kind of Mr. Davis's Directors to invite the Association to Gravesend for their next meeting.

### VOTES OF THANKS.

Mr. CHILD proposed a vote of thanks to the President for the manner in which he had conducted the affairs of the Association during his year of office. His methods had been such as to add merit to their Association.

Mr. PATERNOSTER, in seconding, suggested that the Council be included in the resolution.

This was agreed to; and the motion was cordially carried.

The PRESIDENT having responded,

Thanks were also conveyed to the two readers of papers, on the motion of Mr. YOUNG, seconded by Mr. RUGGLES.

### REPORTS OF COMMERCIAL SECTIONS.

The PRESIDENT remarked that they had received the reports of the Commercial Sections of the Association. As time was short, he thought the best course would be to hold them over, and let the Secretary of each section have them printed, and handed to the members at their next meeting, or sent by post.

Mr. SHADBOLT moved that the reports be printed and sent to each member of the Association, and that they be not further published.

Mr. JOLLIFFE asked whether Mr. Shadbolt meant each member of the Association.

Mr. SHADBOLT replied in the affirmative.

Mr. TROUGHTON seconded the motion; and it was passed.

This concluded the business proceedings.

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In the evening the members and friends attending the meeting dined together at the Saracen's Head; and they were honoured by the presence of many of the city's leaders and officials. A long toast-list and musical programme were gone through.

A number of the members stayed over Friday in order to visit the objects of interest in the ancient city, including the Cathedral, over which they were privileged to be guided by the Rev. the Sub-Dean of Lincoln.

## LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

### The Question Box.

Last Wednesday the Association held a meeting at the Cripplegate Institute, under the Presidency of Mr. W. UPTON, for the purpose of discussing the portion of the list of questions circulated among the members which there was not time to deal with at the February meeting.

*Which is the better method of condensing gas, under pressure or vacuum? Give reasons.*

Mr. Farquhar said he had never seen in text-books a real explanation of which was the best method; but it was the general practice to put the condensing plant before the exhausters; and he thought this was to get rid of the bulk of the tar before reaching the exhausters. The President asked whether he was right in assuming from this that the present practice of putting the condensers before the exhauster arose, not from considerations of condensing, but from those of convenience in working the exhauster. Mr. Farquhar said it was the practice to run the foul main, which was really a condenser, round about the retort-house, or zig-zag on the wall. This was to get the temperature gradually reduced. Mr. Barnett said his experience had been mainly in condensing under pressure; and in that case the gas was brought directly from the retort-house through the exhauster by as near a way as possible. In fact, the pipes were covered with some non-conducting composition to keep them as hot as possible, the gas passing through the exhauster at from 140° to 160° Fahr.; and then condensation took place very suddenly. As the tars varied so much in different works, it might not be suitable under some conditions; but his experience was that the tar helped to lubricate the exhauster. There was no objection at all from that point of view. The idea that condensing under pressure was likely to rob the gas of some of its illuminating power, was a fallacy; it had no effect at all in this direction. At the time they were condensing under vacuum, they were much troubled with naphthalene; but condensing under pressure had a very beneficial effect in removing this. The President thought the question of the loss of illuminating power would depend upon the quality of the gas. It was quite possible, if they were getting all they could out of the coal, and the gas was of (say) 16 candles, there was nothing in it to condense out; but with gas of higher power, there might be a good deal. Mr. Farquhar asked what was the type of condenser. If they took the ordinary form, which was merely cast-iron pipes, he failed to see where the difference came in between condensing before or after the exhauster. If there was a condenser giving a surface on which the gas could impinge, pressure might be better than vacuum.

(1) *What is the best type of burner for public lamps, the "C" pattern or the Kern; and have the mantles the same life on either type of burner?* (2) *Should the mantles in public lamps have chimneys? If so, is a short or a long chimney most suitable; and are the breakages greater in the one than in the other case?*

Mr. Liberty thought that with the Kern burner they got a very good result when it was first put up, and everything was new and clean; but this result was not maintained for any length of time—especially in London, where there was a very thick atmosphere, and particularly in the six dirty months. The Kern burner was liable, he found by experience, to fur up under the gauze; and the illuminating power dropped very considerably. If they took any type of "C" burner, they would find that, though they could not get so good a candle power to start with as with a No. 4 Kern, yet the light they did obtain would be maintained much longer. As to chimneys, he should not recommend a chimney for the Kern burner; but with "C" burners he should do so. It must be Jena glass; and he rather preferred the 8-inch chimney to the 6-inch, on account of the pull—on the principle, of course, of the self-intensifying lamp. The President remarked on the number of years the ordinary "C" type of burner had maintained its position. Notwithstanding the various patterns which had been brought out to consume between 3 and 5 cubic feet of gas per hour, there was nothing he had come across so good for ordinary purposes as the "C." Mr. Liberty added that it was looked upon as less expensive to maintain from the gas companies' point of view than the Kern, which seemed to have a tendency to wear away the mantle at the bottom; and then the mantle, with the least wind, wobbled. He had not in his experience found this with the "C." Mr. Brown thought the wearing away of the mantle was owing to the construction of the wheel at the top of the Kern burner. Mr. Winmill said the "C" was no doubt a very excellent burner; but he believed that if there could be a governor always fixed with it, the results would be better. He had examined certain "C" burners, and had found either that the air supply was too great or there was too much gas. He frequently came across consumers who found these burners did not give the light they should do; and they adopted all sorts of methods of closing some of the air-holes. The Bray, of course, was all right

in this respect. Mr. Farquhar pointed out that they could get adjusters. Mr. Hewett thought there was no doubt the "C" burner could do with an air-adjusting arrangement. Mr. Wheaton remarked that he had a Bray burner, and it answered very well. Mr. Farquhar was of opinion that there was no difference between a "C" burner with the right nipple and an adjuster and a Bray burner. The unfortunate point about the "C" burners was that they were sold without adjusters. In many cases people complained that the gas was not good, and the mantle got black; and then they gave them an adjuster, which seemed to put things right. Again, some tradesmen sold cheap "C" burners with nipples that were not suitable for the gas supplied in the particular neighbourhood. One could adjust the gas in the Bray; but it came to the same thing if one adjusted the air in the "C" to suit the gas. Mr. Collister said he had had better results with the "C" burner than with the Kern. They found they required three mantles to the latter for one to the former. The President said several members had touched on the effect, but not on the cause. The flame of a Kern was much shorter than that of the "C" burner, owing to the better admixture of gas and air; and the flame being smaller, it was concentrated on a smaller portion of the mantle, and therefore such light as came from the mantle was from a smaller space. The work, in other words, was concentrated. With the "C," the quantity of air taken in was not so great, and the flame was longer. The light was therefore taken from a larger area; and therefore per unit of mantle the wear and tear was necessarily less. This seemed the primary reason why a mantle lasted better on one than on the other. As to the chimney, it appeared that this depended largely on the quality of the gas. With a pure coal gas, the flame was long. The richer the gas, the longer the flame; and to supply it throughout with a sufficient quantity of oxygen, a good draught was needed—which meant a chimney. The richer the gas, and the longer the flame, the longer was the chimney required to be. On the other hand, with a mixture largely composed of water gas, the flame was very short, and consequently very hot; and under these circumstances, there was no point in having a chimney.

*What is the best standard to work to—make per ton or make per mouthpiece?*

The President said this question, like so many, depended upon something that was not expressed. Make per ton implied efficiency—that you could get it out of the coal; make per mouthpiece meant efficiency as regarded area. It might be quite advisable to sacrifice one, according to the circumstances, in order to gain the other. Make per ton was the usual guide; make per mouthpiece carried with it, according to his reading, something of the financial element. To Mr. Barnett, the first thing seemed to be make per ton. He could, of course, understand in the depth of winter, in works where the plant was not quite sufficient, it might be necessary to get big makes per mouthpiece, say in foggy weather; but he could not imagine it under any circumstances as everyday practice. Make per ton was certainly the thing to work to—make per mouthpiece, too, if they could manage it. Mr. Farquhar said both expressions were used in ordinary practice in a large number of works. The coal was not weighed into the retort; but it was usual to put down in the manufacturing book the gas made, and to run it out at the end of the week to the make per man and also per mouthpiece. This was often a common standard in works practice; but if they wanted to see what their results really were, they would take the coal stock and work out the make per ton. It was, however, impossible to say they were making so many feet per ton, if they did not know what coals they were using in the retorts. It was a guide to the foreman and also to the manager on the works to reckon it roughly in the works book per mouthpiece. Coals were always bought on the make of gas one could get per ton. Mr. Scarth said that in the comparing of different works, the make per ton would be the only guide. Use them both on the works; but for the balance-sheet, make per ton. Mr. Farquhar remarked that they could hardly compare one works with another as to make per mouthpiece, because the size of retorts varied. For this purpose, the make per ton was certainly the figure to use. The President thought that the make per ton was the true standard to work to.

*Should tar be treated in any way before being used as a paint for ironwork; and is it of any value for this purpose as against the usual paints?*

The President said this was a question upon which many of the members would not be able to give much information, as they were connected with large works; but there were works where paint was not bought for various reasons, and sometimes in these cases tar was used. Some years ago, in another part of the world, he had helped to cover a great deal of ironwork with tar. It was found necessary to boil it, and drive out all the ammoniacal liquor and the light oils, or most of them. With lime or portland cement, this was an excellent preservative. Some years afterwards, he scraped off a little of the tar, and found the iron in perfect condition. It was in a semi-tropical climate, liable to great storms, so that the test was a severe one. After neutralizing with this calcium compound, the tar dried very rapidly—in about a quarter the time of the raw tar. This was a great advantage. Nothing could beat it, where liable to the effects of salt water. Mr. Barnett thought tar had been condemned in many cases for preserving ironwork when the fault was in not applying it properly. If the tar was heated and mixed with about one-eighth naphtha, and then some lime added to neutralize the acid element, the result was a very effective preservative. But it was necessary to clean the ironwork; it was no use putting tar over a coat of rust.

*The light received from (say) a mantle when being tested on a photometer is that emitted from the front of the mantle together with a portion from the sides. (a) What is the total light emitted in all directions from a mantle giving (say) 60 candles in a horizontal direction? (b) Does any light reach the point of measurement from the side of the mantle which is turned away—such light having, of course, to pass through the side of the mantle facing the photometer sight-box?*

Mr. Grimwood said the first question he presumed to mean the hemispherical or the spherical intensity of the mantle which gave 60 candles horizontally. The paper read by Mr. James Foreman before the North of England Association of Gas Managers (see "JOURNAL" for May 1, 1906, p. 309), gave particulars as regarded many different burners tested hemispherically—and spherically, too, he believed. But if the member who asked the question meant by in all directions north, south, east, and west, if the light was 60 candles one side (say, north), it would, provided the mantle was fixed vertically, and the flame and the burner and everything was in a vertical position, of course, be 60 candles on the other sides. The President: How many sides? Mr. Grimwood replied that if the mantle was fixed perfectly vertical, and the burner and the flame were both vertical as well, no matter in what position they turned the burner, it would give 60 candles. If they were going to compare mantles, they must say it was 60 candles; it was nothing more. He did not know how anyone could say he increased the light from his mantle by using a reflector. He thought the question meant the spherical intensity or the hemispherical intensity, because a point was made of the word "horizontal." The horizontal position was not absolutely the best position to test a mantle in. He should think the answer to the second part of the question would be "No," because the mesh of the mantle would stop any light from coming through. The only question was whether the other side of the mantle being concave would reflect a certain amount of light; but that, of course, would be calculated in the 60 candles. Mr. Clark, referring to the first part, said it seemed to him that if they took a mantle which gave 60 candles in all directions, that was 60 candles. If a mantle gave 60 candles in one direction and 70 candles in another, they took the average. A "candle" was a light that gave 1 candle in all directions. If they put a reflector behind the standard, it clearly ceased to be a standard. With regard to the latter part of the question, the light projected upon the disc or screen from a mantle was, he thought, emitted partly from the outer surface of the side nearest the disc, and partly from the inner surface of the opposite side. This was clearly shown by the fact that a hole in a mantle could be seen through the mesh of the opposite side when the mantle was incandescent. He was making an experiment some time ago bearing upon another matter, and obtained the following result: A mantle when incandescent gave 93 candles. A narrow strip about ¼ inch wide of the mantle was then cut out from the side turned away from the photometer disc to within about ¾ inch of the top; and the illumination of the disc then corresponded to 8.4 candles—showing that in this case the light received upon the disc from the interior surface of the strip which was cut away was 9 candles. This, of course, had to be transmitted through the mesh. It was fair to point out that these figures probably did not represent the true illuminating effect of the interior of the mantle, because the removal of the strip would deform the flame from its original shape, and so complicate the result. Mr. Wedd said he had satisfied himself that it was possible to see between the meshes of a mantle; and he was of opinion that the meshes themselves were transparent when hot. Mr. Clark: I think the fibre of the mantle itself is opaque when hot.

*In the gas industry, it is sometimes necessary to go into a danger zone with a light of some kind to discover a leak of gas. Is there a safety lamp that you would recommend for use in such an emergency?*

Mr. Scarth said an electric safety lamp with a small accumulator answered very satisfactorily. The globe was enclosed in a second stout glass globe, so that unless it received a very hard knock, nothing would happen. The switch was a very good one. Mr. Farquhar said these portable lamps did give a spark when switched on sometimes; and it was therefore better to switch them on before entering the danger zone. Mr. Barnett said he would not take even an electric lamp into a danger zone. As for the gauze safety lamp, he would not have one under any circumstance whatever. The President: Then I may take it that in your opinion there is no absolutely safe lamp? Mr. Barnett: That is so. Mr. Farquhar said it seemed to him that a lamp one engineer would take into a danger zone, another would not. It was carrying the matter to the extreme to say there was no safety lamp. For practical purposes, there was a safety lamp made, and that was this electric lamp. Mr. Clark suggested, as a safe means of switching on, that if the two terminals from the cells were sealed into the end of a strong glass tube containing a

globule of mercury, and a mechanism arranged so that the tube could be tilted up and down to allow the globule to make and break the circuit, there would be no danger from sparking. He recommended anyone interested in the question to consult a paper on "The Use of Electricity in Mines," read at the Institution of Electrical Engineers in 1901. Mr. Grimwood remarked that he could not see how sparking could take place when once the light was switched on. Mr. Barnett pointed out that the difficulty was that the man might not switch it on before he reached the danger zone. He thought the electric lamp might be safe if it was turned on outside.

## THE VALUE OF EFFICIENT SALESMANSHIP.

At the last Meeting of the National Commercial Gas Association of America, a paper on "Salesmanship" was read by Mr. J. D. Kenyon, of Chicago. In the course of it he made the following remarks.

Science has brought about such a perfect condition of affairs in the producing part of the commercial world that there is no longer much question as to the manufacture of goods in quality, quantity, and price. The great problem is their distribution, to keep up with the production on a basis of growing and profitable trade. Now the business world is bringing the light of science into the distribution end of its work all over the world. In America especially there is a wonderful awakening in this direction. The programme for this meeting of the Association indicates that your main difficulties are not with the producing end of your business, but with the selling end. The more this subject is studied, the more it will be realized that it is simply a question of efficient organization. In its essence, it is really a question of salesmanship.

Of late years, much thought and attention have been given to this subject on the part of many concerns. Various attempts have been made to improve the conditions. Every employer is constantly on the look-out for good men; but these are scarce, as they already have jobs. Therefore it is evident that the employer cannot simply wait until a good man turns up. The next best thing to do, therefore, if not the best entirely, is to develop good men; and this is purely a question of education.

Unhappily, our educational system has been such that young men starting out in the business world are not equipped with the right kind of training for successful action; and therefore it devolves upon the proprietor to see that he gets it. This being admitted, it is simply a problem of method. Several methods have been tried with varying success; but, as a rule, they have not been satisfactory. Some proprietors have instituted occasional lectures, while others have worked on the method of using periodical letters or bulletins. Some have even organized special schools of training on the details of the selling-points. You can fill the employee full of technical details; but, after all, if the man is not right himself it avails but little. If he is not a man who is constantly seeking a development of his natural forces and the widening and application of his knowledge, you cannot and do not, get the best results.

Any system of education that will be a success, therefore, must embrace two cardinal features: First, training on the vital problem of man-building; second, the development of the study-habit. The effectiveness of an individual is the sum-total of the growth of his mental and his physical forces *plus* his knowledge of the business and how to apply this knowledge most directly. True education consists of the dual process of the symmetrical education or drawing-out of the natural mental and physical forces, and of the instruction in useful knowledge—with emphasis on the "useful." This process requires study, and, therefore, the habit of study must be formed and carried out through life, if true progress is expected. We either go forward or backward—that is, we are either better or poorer business men to-morrow. And to be better business men requires work, energy, study. Hence the necessity for instituting an educational department in every well-regulated institution—a fact which the commercial world has latterly come to recognize. Indeed, it is rapidly realizing that it is even more urgent to expend money in the direction of the developing of efficiency through educational channels (thereby adding to the assets of the company), than to spend it in improvements at the production end of business.

Now, why is this necessary? The basic law of all true business relations is the law of confidence. This confidence consists of belief in the institution (the composite salesman) and in the product the institution sells. As stated before, the production end of business is in such a condition that confidence—in the use of gas, for instance—is well established. You have spared no pains or money to bring this up to a state of perfection. Well, the next step is to see that such improvement is made in the personality of the institution that confidence is inspired and maintained there also. This gets right down to the question of the individual—the man who comes in more direct touch with the public, who has the ability to inspire or destroy confidence. When once the salesman secures the confidence of his customer, the battle of success is half won.

On what, then, does confidence rest? Is it not on his personality? By that I do not mean simply good looks and good clothes, but the personality—the outward reflection of the true man within. In other words, it is the evidence of his character and of his health. Character and health are not simply natural-born qualities, but are developed; and the greatest developing agency in the world to-day is education—true education—which consists of both the eductive and the in-filling processes.

Again, the value of the employee depends upon the amount of supervision that he requires. If he does not need any looking after, his value is at the highest. He has genuine initiative—a very rare quality in these days. Supervision is occasioned by the errors of the employee—errors of omission *plus* errors of commission. If the employee did everything he should do, and if all he did were done correctly, he would make no errors and need no supervision, and his value would be at the maximum point.

Now, the problem is: What occasions these errors? Upon analysis, we find they are due to negative conditions, both physical and mental. Anyone possessing the physical negatives of weakness, laziness, and awkwardness reflects a personality that is anything but pleasant—that is, in fact, ugly. A man must have the ability not only to get into the game, but to stay in it; to move quickly and directly; and to be ceaseless in his energy. Too little attention has been paid to this on the part of proprietors. It has been stated that 50 per cent. of the lack of good results is traceable to the want of proper attention to the question of health. Let us look for a moment at some mental faculties. First, perception. The negative of perception is dullness. One who has not the ability to perceive things—has not good faculties of observation—can have but very few ideas. The world wants men of ideas—men who can observe things. He also must have a good memory, because the memory is the storehouse of the impressions—of the ideas that come into the mind. Every business man knows that the memory is a great asset; but very few realize how great an asset it is. The negative of memory is forgetfulness; and many an error on the part of the employee is traceable to this. He must also possess a good free imagination, which is the ability to take the ideas stored in the memory, and reconstruct them into new plans, new methods, and new achievements. Imagination is one of the greatest faculties brought into play on the part of successful men; its negative is obtuseness. The employee who is working along blindly in a rut, purely mechanical, is obtuse. The one who is quick, alert, and progressive, and planning and improving in his methods and his results, is using the faculty of imagination. Give me a man of good physical strength, one who possesses the good strong mental faculties of perception, memory, imagination, and reasoning, and I will show you a man who has constantly developing ability and who will surely do things.

I have talked about the "eductive" part of education; and now I want to take up a little time with the "instructive" part—the in-filling of useful knowledge, so that a man can direct his power and energy in the paths that will bring results. The track for this human engine to run upon is the knowledge that he has of his own particular line of business. Salesmanship is the power to persuade people to purchase at a profit that which you have to sell. We have discussed the power, now we will discuss the people.

A business man, and especially a salesman, must be a good student of human nature. He must be able to read that open book of humanity written in the faces and actions of men. In order to handle people successfully, we must operate in harmony with the law of non-resistance; and it is essential that we should become more proficient in the reading of the types, temperaments, motives, habits, and ideals of people, so that we can shape our arguments in a way that will best appeal to them. The next thing I would suggest is a close application to the study of logic as applied to business. A man cannot know too much about his own propositions. In the application of this subject to the gas business, I would suggest the advisability of every employee who comes in contact with the public making a thorough study of the gas business in all its phases of manufacture and distribution. He should be taken through the works and shown all the details in connection with the making of the goods. He should make a thorough study of every possible use to which gas can be put, and of all the appliances that have been invented for the purpose. He should get this information as nearly as practicable from the manufacturers of the appliances. He should discover, as far as possible, new ways for applying the product. Having a good grasp of all the points of advantage of the proposition for the customer, he should study them out to perfect himself in explaining these points in such a way that they will naturally appeal to the mind of the customer. A salesman is, or should be, an orator, in the practical sense. His audience may be one or a thousand; but the real orator studies natural effects, not artificial ones. When we are most natural we are most convincing.

Finally, the business man, and particularly the salesman, needs to acquire a more thorough knowledge of the workings of the human mind. He should realize that he must carry the mind of the customer up four steps: First, attention; second, interest; third, desire; and, fourth, resolve to buy, or decision. The mental law of sale is this: Attention once secured will naturally change to interest; interest intensified will naturally change to desire; and desire made strong enough will naturally change to decision to buy. Few men really appreciate the importance of the first step—attention. When once attention is secured, he must quickly shoot such arrows (points) into the mind of the customer that he will immediately become interested; then he must hold that interest by shooting in more and more points

until desire is created. He must develop that desire until he can note that the customer has arrived at a decision, and then he must stop talking and act. More sales are lost by over-talking than undertalking, for want of a better understanding of this great law. There is a delicate balance in the mind of the customer—the time between desire and resolve. It must be appreciated by the salesman, and his actions and address must be governed accordingly.

These are all points that must challenge more and more the attention of seekers of business success, and particularly the proprietors of institutions, so that they can adopt plans for development along these lines, and thereby at once do more to increase the assets of the company than any other thing they can do. One of the great "slogans" of to-day is that of co-operation. In harmonious action—in team work along the lines of true education—will come the true and the permanent success of the future. Proprietors must themselves encourage, financially and morally, the best of such methods. They must participate in studies along these lines with their employees. They must organize them so that the men of the different departments meet together—the employer meeting with them. They must learn to study together, and thereby at once become better acquainted with each other; getting the benefits of each other's ideas, developing a love and enthusiasm for the work and for the institution with which they are connected—thus realizing that they are all a vital part, and all interested in the success, of the enterprise. Employers must be willing to spend money to get increased results, and then to reward proportionately the individuals who have helped to produce them. Then will come true progress based upon the law of mutual benefit.

## ADVERTISING END OF THE GAS INDUSTRY.

In the course of a paper read by Mr. C. W. Lee, of Newark (N.J.), on the above subject, at a recent meeting of the National Commercial Gas Association of America, he made the following remarks.

In the organization of a new business department, it is essential, in order to ensure the best results, that a very careful list of prospective customers should be produced. To do this, a census of the town or city must be made, not from a directory, but by house-to-house canvass. This census should cover buildings and dwellings, as well as families. It should also carry information concerning services installed, lighting customers, meters in service, ranges installed, dwellings on the line of mains not using gas, and buildings not upon the mains. From such a census, the prospect list can be arranged, by a simple but efficient card system, either into districts or by streets. The manager of the commercial department should at all times have this list under control. He should require a daily report from canvassers on the localities visited; and the result should be entered upon the cards. By this method, in the event of illness or the discharge of the canvasser, the work can be taken up without any trouble by new men.

Then the advertising, which, by its very nature, is secondary to the soliciting force, should be carefully planned to meet the local conditions. By making this advertising efficient, the calls of the canvasser can be greatly reduced, thereby increasing the possibilities in volume of business. Advertising must be divided into two classes—specific and general. The former consists of direct-by-mail and house-to-house distribution of pamphlets, letters, &c.; while under the general advertising head may be classed newspapers, bill-boards, street-car advertising, and programmes. The best results in the gas field have been obtained by the use of specific advertising. It paves the way for, and is first aid to, the canvasser. This method, augmented by strong newspaper copy, is bound to bring effective results. Some managers seem to have an idea that it is only necessary to plan an advertising campaign, and that the business will then take care of itself; but persistency and perseverance are as necessary in the commercial gas field as in any other line of business. Advertising is only the assistant, not the general, manager in the business-getting company. I believe it is a serious mistake for gas companies to sell either domestic or industrial fuel appliances at or below cost. By the right kind of advertising and canvassing methods, a nominal profit can be made upon appliances without decreasing the output. Of course, gas managers will say they are interested in the sale of gas, not appliances. But why not make a profit upon the mercantile end of the business?

There is real advertising value in a properly-lighted and well-arranged display window and show-room, displaying appliances and fittings in operation, which cannot afford to be overlooked. I recently stepped from the train in a city of about 50,000 inhabitants, at 5.30 p.m., and inquired the way to the gas office. I was directed down a brilliantly lighted block—with a Nernst lamp suspended in front of every business place—to the opposite corner. There was the gas office. Its window curtains were drawn, and there was no sign of light or life anywhere. That gas manager is neglectful of his duty to the public and to his company. Another, in a city of 100,000 inhabitants, when speaking of new business development, said: "Why, we have sold 400 ranges this season. That is a very good record, don't you think?" I told him very frankly that I did not think it was a good record, and that in such a live town he should be selling 4000 rather than 400 ranges a year. He had the wrong view-point.

The lack of confidence, coupled with inexperience in the art of advertising, has caused failures to those gas managers who have once tried and then abandoned this method of securing additional customers. The aim of all advertising is to aid in the selling of something. If it does not accomplish this, it has failed in its mission, and the money expended in the endeavour is lost. The preparation of advertising matter is an all-important element. It deserves time, thought, study, and, most of all, practical experience. In the midst of the thousand-and-one details of conducting a business, a gas manager probably has not the time nor the inclination to concentrate his mind on the preparation of "copy." If that be the case, call in the advertising specialist. Good copy is the vital spark of advertising. Advertising that lacks the elements of salesmanship is a very extravagant waste of money. No matter how inexpensive the mail card or the folder you use, if it is not selling your goods, or assisting in doing so, it is a loss, and the opportunities it possessed are gone for ever.

Advertising does not consist in merely printing handsome booklets or other pieces of literature, but in the proper distribution of such matter. There are store-rooms throughout America where there are thousands of manufacturers' booklets and catalogues, covered thick with dust, which have never been distributed. This state of things is not fair to the company, nor is it fair to the manufacturers of appliances. If these booklets have any value whatever, why not distribute them? If they have no value, do not place an excessive order with the manufacturer or the printer. Some manufacturers have adopted the policy of developing local fields by distributing their own printed matter—putting their own men in the field, and then following it up consistently. I know of several manufacturers who by such a policy have increased their sales more than 50 per cent. during the past season.

Many boards of directors are pursuing the policy of retrenchment—refraining from investing in new equipment and making main extensions. When a policy of this kind is determined upon, it becomes necessary for the commercial man to develop the field along the line of his present mains. Recently I had a conference with a gas manager in a large city, who stated that the company had upon their books 12,000 non-paying customers—consumers who were not using even a minimum quantity of gas. It is with this class of consumers that educational advertising can be used to material advantage.

There is now a movement on foot, among the leading gas companies, to adopt publicity methods. By this I do not mean regular advertising, but a form of newspaper publicity, showing the policy of the company, what they are expending and have expended in improvements, the efforts they are putting forth to give good service, and the advance of other cogent reasons discountenancing the chronic cry against high gas bills. These publicity methods are proving most successful.

In conclusion, let your efforts be persistent, never for an instant stopping; and remember that it is only by keeping everlastingly at it that gas sales are increased and that success is ultimately assured.

## Development of German Coal Resources.

Interesting particulars collected by Herr O. Simmersbach, of Düsseldorf, of the output of the coal mines of Germany during the past decade, and of the import and export coal trade of the country, have been reproduced in a recent number of the "Journal für Gasbeleuchtung." Dealing first with coal proper (and later with brown coal or lignite), Herr Simmersbach shows that the amount of coal raised in Germany in 1905 was 121,298,000 metric tons, or 53 per cent. more than in 1895. The value of the coal raised, however, increased between the two years by as much as 95 per cent. The highest value per ton was attained in 1901. Of the total coal raised in 1905, over 93 per cent. came from the various Prussian coalfields. The coal raised in Saxony, Alsace-Lorraine, and Bavaria, however, secured a higher average price. The coal imported amounted in 1905 to 9,399,693 metric tons, or to nearly 8 per cent. on that raised in the country. Almost 80 per cent. of the imported coal came from Great Britain. The imported coal obtained a much higher average price than the native—viz., 14s. 5⅛d. per ton (English), against 8s. 9⅝d. per ton for the German coal. Germany exported in 1905 18,156,938 metric tons of coal, mostly to Austria-Hungary and to Holland. The brown coal raised in 1905 amounted to 52,499,000 metric tons; while 7,945,261 tons were imported from Austria-Hungary. The export trade was negligible. The native brown coal was valued at only 2s. 4d. per English ton—a slight falling off from the value in 1895. The amount raised in 1905, however, showed an increase of 110 per cent. on that raised in 1895. The bulk of the brown coal raised came from the Prussian fields.

**National Physical Laboratory.**—The Committee appointed, under the chairmanship of Mr. Gerald Balfour, to inquire into the work now performed at the Laboratory has been engaged for some weeks in taking evidence, and will continue to do so. The witnesses examined have been Dr. Glazebrook, the Director of the Laboratory, Dr. Percy F. Frankland, F.R.S., the President, and Sir William Ramsay, K.C.B., F.R.S., the Vice-President, of the Institute of Chemistry, and Mr. Bertram Blount, F.I.C.

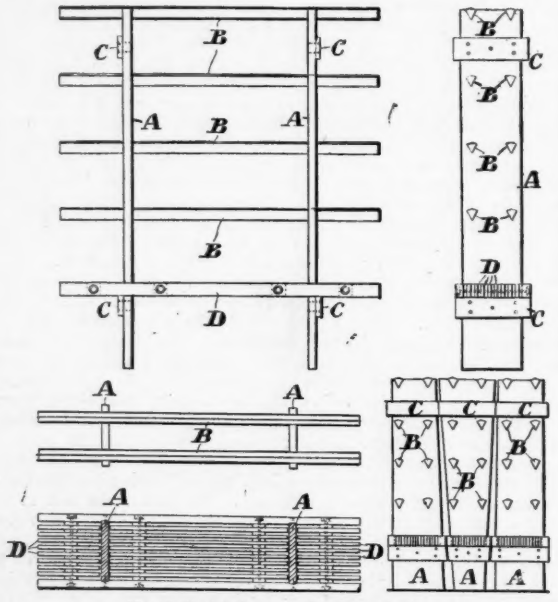
# REGISTER OF PATENTS.

## Purifier-Grids.

MARSHALL, F. D., and HERSEY, S., of Westminster, S.W.

No. 7538; March 28, 1906.

The object of this invention is to provide a construction which will allow of purifying material being changed with a minimum of handling by employing "a number of frames or racks in the shape of rectangles having greater length than width, which racks are arranged side by side in a vertical position and provided with a number of tiers or bars arranged in vertical alignment and so that the bars of adjacent frames are in horizontal alignment." These racks may be supported in the purifier upon an ordinary grid, or may stand upon the bottom of the vessel and have the lowest tier of bars arranged so close together as to prevent the material falling through, and to take the place of the ordinary grid above referred to.




Marshall and Hersey's Purifier-Grids.

The illustrations show a side view of the rectangular frame or rack, an end view, a plan, and a section; also a view showing how a series of racks may be arranged to stand upon the bottom of a purifier.

The vertical rectangular frames A are of a height suited to the vessel in which they are to be placed, and several sets of bars B serve to support the purifying material. In practice, a series of such racks is introduced into a purifier; and in order to afford rigidity the rectangular frames are provided with cross-pieces C, which project beyond the sides in such a manner that, when the frames are placed together, the cross-pieces come into contact and give the desired rigidity, and at the same time prevent the frames coming into close contact, thereby leaving gaps or spaces through which the gas could pass laterally between the frames.

In order to prevent the racks from binding one against the other when being lifted out, one of the racks is made wedge-shape, so that directly this rack is lifted the necessary freedom is provided.

## Torchshaft or Ladderpole for Use in Street Lighting.

BLOOD, A. T., of Hitchin.

No. 27,896; Dec. 7, 1906.

This lamplighter's "torchshaft" or "ladderpole" is made of wood or metal tubing, with the top part so arranged that a detachable hook can be inserted at will to attach the shaft or pole to any column, lantern, or the like; while to the lower part of the shaft or pole are attached a succession of steps or rests, to enable it to be mounted or climbed.

## Lighting and Extinguishing Lamps from a Central Station.

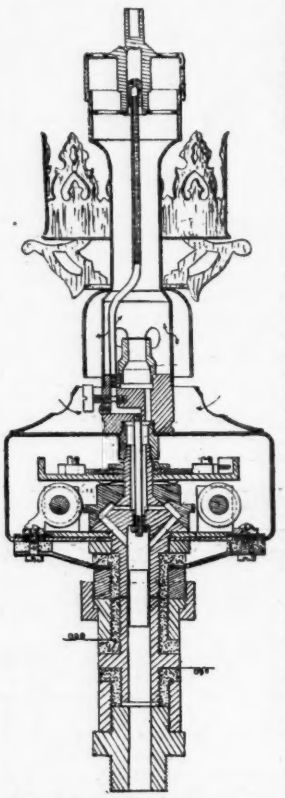
LENTSCHAT, G., of Hohenschönhausen, near Berlin, and DRAHONOWSKY, W. J., of Miröschau, Bohemia.

No. 20,326; Sept. 12, 1906.

The patentees preface a lengthy specification (more than 13 pages in all) with a general account of previous suggestions in the same line. In the course of their introduction, they make the following statements.

Already fifty years ago the idea was conceived that gas-burners or lamps in a system might be simultaneously, or in a rapid succession, electrically lighted and extinguished from a central station; and various constructions for attaining this object were invented. However, in the state of the art at that time, it was impossible to accomplish the task. It was, for example, proposed to employ permanent magnets oscillating between the poles of opposite electromagnets for opening and closing the gas-cocks of the several gas burners or lamps; but the currents then at disposal were too weak for performing this duty. Even if strong currents had been available, such systems would evidently have been most uneconomical and expensive. The various constructions proposed were also utterly useless and impracticable.

About thirty years ago, when the art had advanced and various improvements had been made, it was thought to be the best plan to employ no less than three separate wire conductors—one for opening the cocks of the several gas burners or lamps by means of eletromagnets; the second for lighting the gas by means of sparks; and the third for closing the gas-cocks and thereby extinguishing the lamps. Means were provided at the central station for sending consecutive electrical impulses over the first and second wire conductors through the electromagnets and sparking device of one gas burner or lamp at a time until its cock was entirely opened and the gas had been lighted. Thereupon this gas burner or lamp was automatically disconnected from the circuit, and a second one was inserted, operated, and automatically disconnected from the circuit, after which the third one took its turn, and so on. For extinguishing the lamps in succession, consecutive electrical impulses were sent over the third wire conductor through the electromagnets of one gas burner or lamp at a time until its cock was completely closed, whereupon the burner was automatically switched off and the second one was switched on; next the third burner, and so on. This means that it took up much time for lighting up or extinguishing all the burners or lamps in the system one after the other; and, moreover, the system was still very expensive.



Lentschat and Drahonowsky's Lamp Lighter and Extinguisher.

About fifteen years ago, a system was invented in which the cocks of the several burners were arranged to be each at once opened or closed by once energizing the electromagnet or electromagnets for attracting an armature, which, by means of intermediate parts, was adapted to turn the plug of the cock through an angle of 60° or 90°. As the burners at that time had no incandescent mantles, they were each provided with a sparking device which was controlled from the armature. Moreover, above each burner was a contact device with a vertical bar, which was to expand when exposed to the gas-flame and contract on the flame being extinguished, and was to act upon the short arm of a bent lever for shifting the long arm from one contact to another one, and *vice versa*. The electromagnets and sparking devices of the several burners were connected in multiple with the source of current at the central station; and the several contact devices were so arranged as to first switch on and then switch off the electromagnets and sparking devices of the several burners in succession, so that the latter were lighted in succession in one direction and extinguished in succession in the other direction—the source of current at the central station being constantly in working order. This means that a current of considerable strength was required for operating the electromagnets and sparking devices of the several burners one after the other, and that a good deal of time was required after the first burner had been lighted before the last one was lighted, and after the latter had been extinguished before the former was extinguished. This old system also presented the defect that it was entirely unreliable and could easily get out of order, since the several gas-cocks, on becoming blocked up, could not be operated at all.

The other known systems all (the patentees assert) present similar defects, and are more or less impracticable. Their invention consists in employing lamps with incandescent mantles and pilot-burners, so as to render sparking devices superfluous. They provide these lamps each with an electromagnetic device as described in patent No. 8792 of 1906, whereby the lamps can be automatically and electrically lighted and extinguished over a distance. The several electromagnetic devices are arranged to be simultaneously operated in such a manner that (for example) if thirty electrical impulses in all require to be sent through them for gradually opening or closing the respective gas supplies, ten of the impulses are utilized for controlling the state of the system, and the remaining twenty for actually opening or closing the supplies. Thereby "the strength of the currents for operating the system is rendered moderate, so that thin and cheap wire conductors can be employed for conveying the currents."

For the better supervision and control, they divide the system into a plurality of successive circuits, which are connected one with another by relays arranged to momentarily close the following circuit, after the preceding circuit has been momentarily closed. The first and the last of the circuits are extended into the central station, and are provided with controlling appliances. The electromagnetic devices of the several lamps are inserted in the circuits, which may correspond (say) to the plurality of the blocks of a town or to the plurality of sections of a plant. The system is so arranged, that, on closing for a moment the first circuit from the central station by means of a specially constructed clockwork or by hand, the several circuits will be consecutively closed for a moment, so that the electromagnetic devices of all the lamps and of the controlling appliances will be operated.

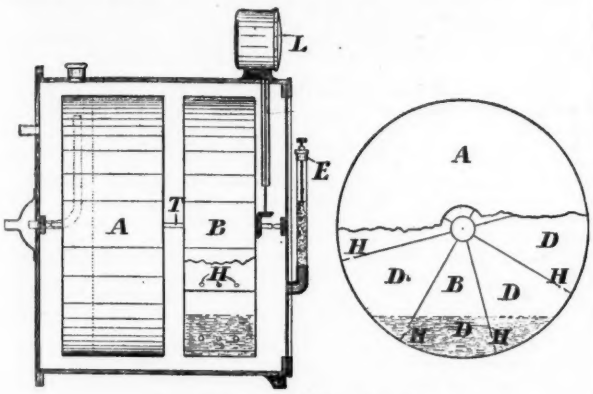
## Gas-Meters.

BEASLEY, F. G., of Smethwick, near Birmingham.

No. 12,650; May 31, 1906.

This invention relates to a meter for delivering a stream of gas of constant magnitude or volume, or at a constant rate of flow—say, a specified number of cubic feet per hour—to any instrument wherein this might be applied with advantage, such as in a recording gas-calorimeter or the like.

To the shaft T, carrying the measuring drum A of an ordinary wet gas-meter, is fixed a second drum or cylindrical vessel B, of copper, lead, or any suitable metal. The interior of B is divided into eight equal compartments D; the partitions forming the compartments radiating from the centre to the sides in such a manner that each compartment forms an eighth segment of the vessel. The drum containing these compartments is hermetically sealed; but the compartments are in communication with each other through a small hole or number of holes H, pierced through the partition near the sides of the vessel. A quantity of oil, water, or other suitable fluid is put into the vessel before sealing.




**Beasley's Constant-Flow Gas-Meter.**

The effect of this device is as follows: If gas is supplied at a constant and suitable pressure to the measuring drum, its speed of rotation, and, consequently, its gas delivery, will depend upon, first, the quantity of fluid in B, and, secondly, the speed that it can run from one compartment to the other through the holes pierced through the partitions; so that the device acts as a governor or controller to the measuring drum of the meter. Provided the pressure of the gas is kept constant, the measuring drum will always rotate at the same speed, and consequently deliver gas at the same rate. To attain this object, it is obvious that a sensitive pressure regulator is required between the measuring drum and the source of supply of gas to be measured; and by varying the pressure different quantities of gas of constant magnitude may be delivered.

The great advantage claimed with this controlling apparatus is that it may be used in connection with crude gases, more or less dirty; the orifice or burner jet through which the gas escapes may be abnormally large; and the quantity of gas passing will not be sensibly affected by the deposit of tar or other substance therein.

The rotation of the drum B, in causing the oil to flow from one compartment to the other through the holes, acts as a constant load or brake to the measuring drum A. The shaft T is geared to an index L of the ordinary type. E represents a sight-gauge for regulating the oil-level in the case in which the two drums revolve.

## APPLICATIONS FOR LETTERS PATENT.

8108.—IBBOTSON, J., and WALLASTON, T. R., "Hydraulic mains." April 8.
8164.—HELLSING, G. H., "Recovering sulphur from sulphuretted hydrogen and gases containing sulphuretted hydrogen." April 8.
8234.—SUTER, F. W., "Gas-burners." April 9.
8272.—LAYCOCK, W. S., "Globe galleries." April 9.
8293.—TULLY, C. B., "Manufacture of gas." April 9.
8311.—ROBERTSON, T. W., "Lighting gas." April 10.
8315.—LYNDE, F. C., "Petrol gas." April 10.
8323.—BRAY, J. W., "Incandescent burners." April 10.
8330.—BIHELLER, S., "Inverted gas-lamps." April 10.
8331.—BIHELLER, S., "Incandescent gas-lamps." April 10.
8371.—EDWARDS, W. C., "Self-lighting incandescent burners." April 10.
8379.—LJUNGSTRÖM, B., "Gas-turbines." April 10.
8394.—MILNE, J., "Bye-pass for incandescent gas-lamps." April 11.
8407.—LEA, J. E., "Meter." April 11.
8512.—CHUTTER, G. F., "Gas-generators." April 12.
8535.—WAKEFIELD, C. C., "Gas-burners for flare-lights." April 12.
8572.—MILLS, F. B., and TEMPLE, W. G., "Gas-valves." April 12.
8578.—HOLZWARTH, H., and JUNGHANS, E., "Gas-turbines." April 12.
8579.—HELPS, G., "Gas lamps and burners." April 12.
8614.—WAKEFIELD, C. C., "Acetylene-generators." April 13.

**Additional Capital for the Havant Gas Company.**—Last Tuesday, Messrs. Penney and Clark sold by auction 200 new 7 per cent. shares of £5 each in the Havant Gas Company, at prices ranging from £6 15s. to £7 2s. 6d. each. The total amount realized was £1369 7s. 6d.

# PARLIAMENTARY INTELLIGENCE.

## HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Basingstoke Gas Bill, Brockenhurst Gas Bill, Keswick Urban District Council (Water) Bill, Maidstone Gas Bill, Mitcham and Wimbledon District Gas Bill.

Bill read the third time and passed: Devonport Corporation Bill.

Petitions have been presented against the Annfield Plain and District Gas Bill by the Annfield Plain Urban District Council and by Messrs. James Joicey and Co., Limited; and against alteration in the Great Yarmouth Water-Works and Lowestoft Water and Gas Bill by the Great Yarmouth Port and Haven Commissioners.

## HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Bill brought from the Lords, read the first time, and referred to the Examiners: Devonport Corporation Bill.

Bills reported: Boston Spa Gas Bill, Grays and Tilbury Gas Bill, Kingston-upon-Hull Corporation Bill [title amended to include purchase of the undertaking of the East Hull Gas Company], Shanklin Gas Bill.

The consideration of the Worthing Gas Bill has been deferred till next Monday, when, in accordance with notice, Mr. Ridsdale (Brighton) will move that the schedule, containing a description of the lands proposed to be acquired by the Company, be omitted.

Petitions against the Metropolitan Water Board (Charges, &c.) Bill have been presented by the Barnet District Gas and Water Company and the West Ham Corporation.

Last Tuesday, Mr. Brodie asked the President of the Local Government Board whether he was aware that it is the custom of the Local Government Board to forbid local authorities using land obtained by means of a public loan for any purpose other than the particular purpose for which it was originally bought, even when there is no covenant between the local authority and the seller of the land preventing its use by the authority for any purpose they desire; whether he was able, by administrative action, to free the hands of municipalities in this respect; whether he would take measures to do so; and whether, in the event of its not being possible to attain this object by administrative action, he would at an early date introduce legislation for the purpose. Mr. Burns, in reply, said the difficulty arose in consequence of certain decisions of the High Court to the effect that, in the absence of statutory provisions to the contrary, land acquired by a local authority cannot be used for any purpose other than that for which it was acquired. He added that the difficulty could not be removed by administrative action; but he said he should be glad to take advantage of any suitable opportunity of dealing with the matter by legislation.

## KINGSTON-UPON-HULL CORPORATION BILL.

### Police and Sanitary Committee of the House of Commons. Tuesday, April 16.

(Mr. CORRIE GRANT, *Chairman*.)

Consideration of this Bill (see *ante*, p. 169) was resumed to-day. In the course of the proceedings on the part relating to finance, "power to borrow,"

The CHAIRMAN stated that the Local Government Board submitted that the period of 50 years proposed for the loan for the purchase of the gas undertaking in clause 32 was excessive. Some parts of the gas-works, mains, &c., to be purchased had no doubt been in existence for many years. The periods allowed by Parliment in the sessions of 1903, 1904, and 1906, for loans for the purchase of gas undertakings were: Chard (1903), 30 years; Nantwich (1903), 40 years; Rickmansworth (1903), 30 years; Appleby (1904), 40 years; Kirkby-in-Ashfield (1904), 35 years; Shipley (1904), 30 years; Pontefract (1906), 40 years; Thornton (1906), 30 years; and Wolstanton (1906), 30 years.

Clause 32 was verbally amended and passed.

On clause 34, "periods for discharge of loans,"

Mr. J. D. FITZGERALD, for the promoters, mentioned that the original power taken in the Bill in the first portion of the clause was to pay off the borrowed money within 50 years. Then there was a correction to 35 years, which was introduced on account of the opinion expressed by the Chairman in the House of Lords; and he now asked the Committee to follow exactly the Pontefract precedent of last year and insert 40 years. What occurred in the Pontefract case was this: The Committee fixed the period of repayment at 45 years; the Lord Chairman having expressed the opinion in that case, as in this, that 35 years was sufficient. When the Bill got into the other House, it went before a Committee of the House of Lords. It was discussed again before that Committee, who had before them the opinion of the Lord Chairman; and they ultimately, after having heard the discussion, substituted 40 for 45 years. In this form it passed both Houses and became law—the Lord Chairman not interfering with the decision of the Committee. He asked the Committee to follow that precedent, because the facts seemed very similar. If necessary, he could call evidence to show that 40 years was a proper and reasonable period in this case.

The CHAIRMAN thought that as to what was a proper and reasonable period the Committee, with their precedents to guide them, were as good judges as any evidence that could be called. But if it was proposed to call any gas engineer to give evidence as to the efficiency of the works at the present time, the Committee would hear it.

Mr. *E. H. Stevenson*, recalled, said the difference between 35 and 40 years had been worked out. It was approximately £600 a year, and this would mean here £650. He had been over the works of the East Hull Gas Company. Some portions were quite new. He saw them being built last year; and since then one large bench of retorts had been pulled down and rebuilt out of revenue. Of the remainder of the works, the greater part was in very good repair. There was one gasholder which had been abandoned. Still, it showed as a gasholder; but the tank would come in of great use as a liquor tank, though the small gasholder itself would have to be written off out of revenue. He should say the mains were now in good order, judging by the unaccounted-for gas. The ground in which the mains were laid did not deteriorate them.

The CHAIRMAN: Judging by the demand, is there likely to be any necessity for relaying the mains?

*Witness:* No; I should think there will not be a necessity for relaying in larger sizes. It is not so much the custom to do so now. If one of the outer districts develops, nobody would think now of relaying the main right away from the gas-works, but would lay a smaller main carrying gas under considerable pressure right out to the district, and there distribute it through a governor. This is the usual way now. With regard to the point of 40 years, the Corporation were allowed 50 years for the repayment of the loan in the old case. Nine years of that have gone; and it will certainly be twelve months or thereabouts before the new loan is made. So that if we have 40 years it will bring all the gas loans to a termination at the same time, and we could consolidate them.

Answering Mr. HELME (a member of the Committee), witness said that a rough estimate of the relative value of the freehold property, lands, buildings, &c., in relation to the whole of the undertaking would be nearly £70,000, within the curtilage of the works, and about £35,000 outside. This would be the capital of £105,000 they had.

Mr. HELME: But you would subdivide the £70,000 again by taking the land and the buildings as being of a class that would not depreciate as much as the retorts?

*Witness:* Yes; but I may say that all retorts, everything that is worn out, as it is worn out, is replaced by new out of revenue, not out of capital. In one sense the plant has a perpetual life, because it is replaced out of revenue. In most cases—such as purifiers, condensers, engines, and those things—they are swept away before their life is completed, and replaced by larger ones. Then the value of the old ones goes to revenue, and the difference to capital.

My inquiry was rather as to the value of the area of the land, and also the structural buildings that do not require rebuilding when they have the retorts replaced?—The proportion would roughly be two-fifths to land and buildings, and three-fifths to plant. But in that plant would be the gasholder tanks and the foundation to the other plant; so that possibly, if you roughly divide it half and half, you would get what may be termed the destructible plant and foundations and buildings and land.

Mr. NICHOLSON (a member of the Committee): You do not know how much the Corporation will be called upon to spend immediately after they get these powers?

*Witness:* I think they would have to spend about £12,500 to provide a little more works and a main leading from the gas-works to the present meter, where they measure the gas from the British Gaslight Company; that is all. They will not have to spend any other additional capital at present. That, of course, we shall have to go to the Local Government Board for, and take what number of years they give us.

After deliberation,

The CHAIRMAN announced that the Committee were of opinion that a case had been made out for 40 years as the period for repayment of the loan for the purchase of the undertaking.

The clause, as amended, was then passed; and the other clauses of the Bill were adjusted.

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In the report of Mr. E. H. Stevenson's evidence on the Bill given in the "JOURNAL" last week (p. 171, col. 1), there was an error in the 17th line from the bottom, which caused a misrepresentation of the witness's statement. The question put by the Chairman was as to the number of years' purchase the Arbitrator (not the witness) gave in the Pontefract case; and Mr. Stevenson's reply conveyed his recollection of what the Arbitrator had done.

## BRIGHOUSE CORPORATION BILL.

### Police and Sanitary Committee of the House of Commons.

(Mr. CORRIE GRANT, *Chairman.*)

The Committee had before them on Tuesday, Wednesday, Thursday, and Friday of last week the above Bill, the objects of which are, among other things, to confer further powers upon the Corporation in regard to their electricity undertaking. Clause 6 provided that the Corporation might refuse to supply gas or electrical energy to any person whose payments for their supply or meter-rent were for the time being in arrear, whether such payments be due to the Corporation in respect of a supply to the same or other premises.

Mr. F. PRITCHARD (Messrs. Sharpe and Co., agents) appeared for the promoters. In opening, he stated that the borough of Brighouse was in the heart of the manufacturing district of the West Riding. The population was between 22,000 and 23,000. It was incorporated in 1893. The Corporation were the owners of their own gas, electricity, and water undertakings. The gas undertaking was bringing in a substantial profit. As regarded the water undertaking, the water was taken in bulk, and there was a slight profit; but the electricity undertaking was in a very small way. The Corporation had a Provisional Order; and a few years ago they purchased a very small undertaking belonging to a tradesman in the borough, at a cost of some £1500. They desired now to extend it in order to enable them to supply not only the whole of the borough, but also the tramways that were coming into the borough.

Mr. *James Parkinson*, the Town Clerk, handed in certain statements, including one showing the working of the water and gas undertakings for the six years ended March 31, 1906. In this period the profit on water had been £1804, and on gas £11,911; and the loss on water £308, on gas £5151, and on electricity £220—showing a total balance of profit of £6056.

Mr. *J. W. Wrigley*, the Borough Accountant, said he was responsible for the tables put in, except one. In the table of outstanding debt (£94,000), £17,275 on the water-works and £77,283 on the gas-works were remunerative undertakings. The charge for water varied on the rateable value. On £100, it was 5 per cent., down to 3 per cent. They had an overdraft on their gas-works. This was to meet the amount they had owing quarter by quarter for gas-rental. This really took the place of working capital. They had no working capital. As rents came in one quarter, they had been at the expense of making gas for the next quarter. They never borrowed more from the bank than three months, generally, to carry on the work. On the account ending March 31, 1906, there was due to the bank on revenue account of the gas undertaking £15,242. That quarter's sale of gas was £8048; and there was the sale of coke and residuals as well, £1247. There was also a stock of coal, &c., on hand, amounting to £9497.

Mr. HELME (a member or the Committee): You have not sufficient capital to work the concern?

*Witness:* That is so. I may say that we have an application before the Local Government Board to borrow working capital, under a previous Act.

With regard to the gas undertaking, in order that we may grasp its financial position so far as we can, may I ask if you have any reserve fund, and, if so, whether it is invested outside the Corporation, or whether any portion, or all of it, is used for working?—We have no reserve fund.

Witness subsequently put in figures showing the various overdrafts, and statements showing the working of the trading undertakings. He said that in 1901 and 1902 there was a deficiency; in 1903 and 1904, there were profits, which were applied in reduction of deficiency; in 1905, £4007 was applied in reduction of rates; and in 1906, £2753. Altogether £6760 was applied in reduction of rates.

Mr. BOYCE, for the Local Government Board, pointed out that the profit was made entirely out of the gas consumers, and yet at the end of the financial year 1906 there was an overdraft.

Mr. NICHOLSON (a member of the Committee): Why was not the £4007 and the £2753 applied in reduction of the overdraft?

*Witness:* Because the Council thought it was profit earned, and they had the right to apply it to the relief of the rates.

Witness further said that application had been made to the Local Government Board for working capital. They applied for £15,000 for gas, and a loan of £6000 for working capital.

Mr. PRITCHARD read the reply of the Local Government Board to the application of Dec. 22 last:

> I am directed by the Local Government Board to advert to your letter of 22nd December last applying for sanction to the borrowing, by the Town Council of Brighouse, of the sum of £15,000 for the purpose of their gas undertaking, and as regards the sum of £6000 required for working capital. I am to state that the Board would not be prepared to sanction a loan merely for the purpose of providing a fund to meet current expenditure on the undertaking. The Board will, however, be prepared to consider an application for sanction to a loan to meet prospective expenditure on capital account, such as for house connections, meters, and stoves, during a period of three years. In support of such an application the Town Council should furnish the Board with a statement showing the actual expenditure on these purposes in each of the last three years. If more than £9000 will be required, a copy of a further resolution in respect of such additional amount should be supplied. The Board also desire to be informed of the circumstances in which the present large overdraft on gas account has arisen, and of the proposals of the Town Council for reducing it."

One reason why he had not referred at all to the gas undertaking was because of the local inquiry which would in due course follow on this application for additional borrowing powers. As there was nothing in the Bill itself referring to the gas undertaking, it seemed to him that it was not necessary to go into the matter in detail, especially as it would shortly have to be gone into before the Local Government Board.

The CHAIRMAN: As I understand it, the position of the Local Government Board is this: "If you want working capital not merely for gas but if the Corporation want money, they must come to us and get sanction before they spend it. But if they have spent money and come to us to sanction what they have done, we will not do it."

The reply of the Corporation was read, in which they stated that the circumstances of the large overdraft arose through the stock in hand generally, but particularly with the stock of gas-stoves and prepayment meters and the credit for the gas sold. The Corporation paid all accounts monthly; and it was quite five months before any return was made. There would be no overdraft provided the Board would give sanction for the £15,000. The letter went on to give the expenditure on gas-stoves during the last three years, and on prepayment meters during the same periods, and the purchases for the four years preceding. The whole of the overdraft was due to the stock and one quarter's gas-rental. Under the circumstances, the Town Council hoped the Board would see their way to sanction the whole amount applied for, so as to put the Gas Department on a proper footing.

Mr. PRITCHARD said the reply to that was simply that the Board would hold a local inquiry.

Continuing, witness said they wrote off their stoves in stock a certain amount for depreciation. They had taken 10 per cent. off. If it came to shillings, they would add them on. Meters and stoves were dealt with under the head of stoves. They put down £9497 for stoves and gas in the balance-sheet of 1906. The item of stoves and meters included fittings, and represented about £1200. They were supplied free of charge to consumers. The financing of this amount was taken out of the charge for gas—it was supposed to cover it. They provided prepayment meters fitted and in working order, and they charged higher for gas and got it in that way. He believed they gave 25 feet for 1d.

Mr. HELME: Has the whole of the capital under the powers that you have already obtained been applied to capital expenditure, or has any portion of it been reserved for working capital?

*Witness:* No; none has been reserved for working capital.

It is usual in granting a scheme for gas to allow so much for working capital. You did not avail yourself of that?—No.

If you had asked for larger capital before, you would have secured a margin for working expenses, which is necessary, and thereby you would not have had the overdraft?—Yes.

On part 2 of the Bill, "electricity and gas," clauses 4, 5, and 6,

Mr. PRITCHARD said there was no objection by either of the Government Departments to any of the clauses in this part. They were all clauses in the common form which the Committee had granted year by year to local authorities who had undertakings. There was one criticism of the Local Government Board on clause 6, and the suggestion they had made had been accepted.

After a brief discussion, the clauses were passed.

The CHAIRMAN, at a subsequent stage, asked from Mr. William Smith, the Mayor of the borough, a definite undertaking on behalf of the Corporation that the system of overdrafts should now cease; and he replied that he thought he could give the undertaking.

The CHAIRMAN said, with regard to the gas undertaking and the charges for lighting, it ought to be brought strictly under the provisions of section 131 of the Act of 1895. The Corporation had made no provision up to the present for a reserve fund at all. They had paid sums in relief of rates which were more than ought legitimately to have gone in that way. They had charged their consumers more than they ought to have paid for their gas. They had not paid off their debt which would have taken up part of the profits; and they had therefore carried a very much larger sum to the relief of rates than ought legitimately to have gone to it. This was a matter the Committee wanted them to give attention to.

The consideration of other parts of the Bill was then proceeded with.

## UNOPPOSED BILLS.

The Committee of the House of Commons on Unopposed Bills presided over by Mr. ALFRED EMMOTT (the Chairman of Committees) had before them on Thursday the following Bills.

### Grays and Tilbury Gas Bill.

This Bill has been promoted for the purpose of incorporating and conferring powers upon the Grays and Tilbury Gas Company. In 1853, certain persons formed themselves into a Company under the name of the Grays Thurrock Gas and Coke Company, for the purpose, among other things, of supplying gas in or near the town and parish of Grays Thurrock, Essex. The limited Company had created and issued 1000 shares of £10 each (the share capital authorized and issued under the Order of 1881), which bore a 10 per cent. maximum dividend, all of which shares were fully paid up. There were also 5400 shares of £10 each (issued under the Orders of 1885 and 1904), which bore a 7 per cent. maximum dividend. These shares were also fully paid up. The Company had received in the way of premiums on the last mentioned shares £3230 odd. They had borrowed on debenture or debenture bonds £14,275. The demand for gas had increased and was increasing. It was now considered expedient that the limited Company should be dissolved and the members reincorporated.

Mr. *E. Herbert Stevenson*, on behalf of the Company, in reply to the CHAIRMAN, who asked what their standard price was, said they were asking for 4s. 4d. They were now charging 4s. per 1000 cubic feet; but they had never paid their maximum dividend. They were now paying 8 per cent. on their original capital and £5 12s. 7d. per cent. on the additional capital. Their maximum dividend was 10 per cent. on the original capital. They were charging 5d. per 1000 feet less than was sufficient to pay their maximum dividend. If they were earning their maximum dividend, they would be charging now 4s. 6d., so as to allow something for a reserve fund. They were giving the consumer a good deal because the Company were not paying their maximum dividend, and never had. To become a standard-price Company they were giving away all the advantages. During the last ten years the Company had been increasing at the rate of 9½ per cent.; in the last four years it was 10½ per cent.; for the last three years it was 11½ per cent.; and last year it was 16½ per cent. The district was growing very rapidly with a working-class population.

Mr. CALDWELL (a member of the Committee) pointed out that in 1904 the Company's capital was £40,000. They were now asking, under the reconstitution, for a capital of £150,000. This was an enormous extension, and there was nothing to show how, in the last two years, such an abnormal extension could take place.

Witness replied in the last two years they had increased at an enormous rate. They were increasing the area. When the Company went to Parliament last they were selling about 60 per cent. less gas than they were selling to-day. They had to extend out, in order to increase proportionately.

Mr. CALDWELL: In 1904, your capital was £40,000, and now you are asking to raise it to £150,000. How much have you spent?

*Witness:* We have a capital now of £64,000.

Then you are asking to raise £64,000 up to £150,000?—That is so. My reason for this is that we shall increase in about twelve years by another 130 million feet of gas. We have extended to Purfleet.

After further consideration, the Bill was ordered to be reported for third reading.

### Boston Spa Gas Bill.

It is sought by this Bill to incorporate and confer powers upon the Boston Spa Gas Company.

Mr. BAKER (Parliamentary Agent) explained that the Company had been in existence for some 40 years. As a limited Company they were, of course, entitled to divide any profits they made.

The CHAIRMAN asked why they did not do so.

Mr. *John Wilkinson*, the Manager of the Halifax Corporation Gas-Works, said the intention was to increase the stability of the Company. The concern was bought by four or five gentlemen, and was no doubt in a bad state. For several years past they had been trying to bring up the stability of the Company. They were originally charging 6s. 3d. per 1000 cubic feet, and there was no dividend. On Jan. 1, 1896, the price was reduced to 5s. 10d. The dividend in 1897 was 3 per cent.; in 1898, 5 per cent.—the price being 5s. 10d.; and in 1899, 4 per cent. A reduction from 5s. 10d. to 4s. 11d. took place as from Oct. 1, 1903. In 1903 and 1904, the dividend was 4 per cent.; in 1905 and 1906, 5 per cent. The shareholders for the last ten years were practically the same as to-day. It was only a small Company. The shares had changed hands very little.

Mr. BAKER said the Local Authority did not object to the Company's proposal.

The CHAIRMAN: You are asking for fresh capital?

Mr. BAKER: Yes, to the extent of £6200.

Witness said the Company was increasing very rapidly at the present time. It had increased 35 per cent. the last three years. There was still a great amount of property undeveloped as far as gas was concerned; and they were actually short of money for the purposes of development.

After further consideration, the Bill was ordered to be reported.

### Shanklin Gas Bill.

This Bill is for the purpose, among other things, of dissolving and reincorporating the existing Gas Company.

Mr. JOHNSON (of Messrs. Torr and Co., Parliamentary Agents) said the existing capital was £10,000 at 10 per cent. and £10,000 at 7 per cent.; and the loan capital was £5000. It was proposed to place the new capital at £66,000 in all. The conversion was to be on the ordinary lines. At the present time, under their Order of 1878, the price of gas was 6s. 6d. per 1000 cubic feet. They were proposing by the Bill to reduce it to 4s. 6d.

The CHAIRMAN: That is your maximum price. What variation do you make in your sliding-scale at present?

Mr. JOHNSON: The ordinary variation—2s. 6d. for 1d.

It was explained by a witness on behalf of the Company that the price they actually supplied gas at was 3s. 11d. They were paying dividends of 10 and 7 per cent. They had taken no advantage of the sliding-scale at all. With the 3s. 11d. price they were just able to pay that percentage—10 per cent. on the original and 7 per cent. on the additional.

The Bill was ordered to be reported.

# LEGAL INTELLIGENCE.

## HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

**Thursday, April 18.**

(*Before Justices* DARLING *and* PHILLIMORE.)

### Benning and Others v. Ilford Gas Company.

This was an appeal by the plaintiffs asking the Court to set aside the judgment of the Official Referee, recorded in the "JOURNAL" for Dec. 4 last (p. 688).

Mr. D. C. LECK and Mr. A. LINCOLN REED appeared for the appellants; Mr. SYLVAIN MAYER and Mr. R. STORRY DEANS represented the respondents.

As soon as the case was called on,

Mr. MAYER took a preliminary objection that no grounds were stated on the notice of appeal, contrary to Order 52 Rule 4, which involved a great hardship in this instance, as the case lasted thirteen days, and a large number of points were taken on both sides. It was simply an application that the judgment which should have been entered for the defendants should be entered for the plaintiffs with costs. There was a cross-appeal.

After a short discussion, their Lordships decided that they would hear the case.

Mr. LECK said the short point was whether the learned Referee was right in treating a plea of payment into Court as a good plea, and giving the defendants the costs after the date of the payment in of a sufficient sum. It was an action in which eleven plaintiffs joined, to recover damages sustained by them in consequence of a flood caused by the negligence of the defendants. Three or four previous actions had been tried, and verdicts obtained against the defendants. After this they no longer contested their liability, and these actions therefore went to the Official Referee to assess the damages. The defendants first paid in £21 15s. with a denial of liability, and afterwards increased the amount to £100, and pleaded payment into Court. He submitted that this was a bad plea, inasmuch as the sum was not apportioned between the various plaintiffs; and Order 22 Rule 2 provided that the claim or cause of action in respect of which money was paid into Court should be specified. These were all separate causes of action, and a separate sum should have been paid in in respect of each one. Having argued this point at some length,

Justice DARLING, without calling upon Mr. Mayer, said he thought the appeal failed. The action was brought by the owner of the equity of redemption and mortgagor and by a number of mortgagees in possession to recover damages for injury done to certain property by reason of negligence on the part of the Ilford Gas Company. The plaintiffs recovered £79 10s. among them; each one getting only a small sum—the largest amount being £15, and one only recovering £1. The mortgagee, who brought the action in respect of the injury to his equity of redemption by reason of its getting wet owing to the flood, recovered nothing at all. In ordinary circumstances, from the moment of the payment into Court, he would have had to pay the costs; but by reason of the other plaintiffs being joined, he escaped this. It was plain that the Official Referee treated the £100 paid into Court as more than sufficient to cover any damage which the plaintiffs in the aggregate had sustained—it being only worth £79 10s.; and it was said that he was wrong in treating this as though it were the case of a

single plaintiff, and applying the same rule with regard to the costs after the payment in as if it were such a case. He thought, on the contrary, that the Official Referee was quite right. He would not go into the authorities which had been referred to; but it appeared to him that the plaintiffs adopted this form of action for their own convenience, and one of them—the mortgagor—had very largely benefited by it. As to the others, it might be that they were not in as good a position as if they had each brought a separate action, though, probably if they had done so, they would have been sent to the County Court. The proper view of this plea was, not that it was as Mr. Leck had argued, but that it was one which might be inconvenient to the plaintiffs, though it might also have been a great inconvenience to the defendants, because it was possible that the plaintiff who recovered £1 was the only one who got anything, and he could have taken out the whole £100, or each of them might have been in the position of Mr. Benning, and not have recovered anything. But the plaintiffs could have gone before the Master, who, no doubt, would have directed the defendants how to distribute the payment. But this was not done. The plaintiffs chose to go to trial without asking for any such allocation, and it was too late now for them to complain. The appeal must therefore be dismissed.

Justice PHILLIMORE gave judgment to a similar effect.

There was a second appeal, by Roberts and others, in which the same order was made without further argument.

Mr. MAYER then opened the cross-appeal by the defendants in the last case. He said that though the amount recovered in that action was small, the points raised were of great importance. The claim was for damages to certain houses, which belonged originally to Benning, and were mortgaged, it was alleged, to several persons, who claimed the damages caused to them by the defendants' negligence. The defence was three-fold—first, that there was no title in the plaintiffs; secondly, a denial of negligence; thirdly, even if there was negligence, there was no damage. There were five trials in all; and as time went on, and they could not get any of the Judges who tried the cases to deal with any other question than that of negligence (the other matters being left for the Official Referee), and as they thought they were safe on the other points—viz., no damage, and in this case no title—the defendants admitted liability for negligence to save expense.

Justice PHILLIMORE: Having admitted liability, you say you are entitled to withdraw from that admission, and ask us to say that you are not liable at all.

Mr. MAYER said the defendants only admitted liability to the owners of property which had been damaged. From the first they always contested the plaintiffs' title to sue.

A long argument ensued on this point; the orders made in the course of the proceedings, and also the pleadings, being referred to. The result was that the Court expressed an opinion that the admission of liability on the pleadings prevented defendants now contending that they were entitled to judgment. They ought to have been more careful, and simply admitted negligence, but not liability.

Mr. MAYER then submitted two further points—first, that the Official Referee could not legally award any damages under either of the two heads under which he had done so. The plaintiffs claimed, first, for the cost of repairing the damage caused by the flood; secondly, for loss of rent, because, as they alleged, some of the tenants left; and, thirdly, for extra repairs not found necessary at the time, and for diminution in the value of the property, on which they recovered nothing, though the matter occupied eleven days out of the thirteen the case lasted. Under the first head, the Official Referee awarded £1 each on 27 out of the 29 houses in question; and under the second, £2 12s. 6d., or seven weeks at 7s. 6d. per week, for each house, with one or two exceptions. He submitted that the mortgagees could not legally claim under either of these heads; the only persons who could claim in respect of a temporary nuisance or damage being the tenants, many of whom had individually brought actions and been settled with. These plaintiffs were only reversioners, and there were authorities to show that the reversioner could only recover for a permanent injury to the inheritance. Here the Official Referee found that there was no damage to the structure or to the reversion. The learned Counsel proceeded to read the judgment of the Official Referee, and cited several authorities in support of his contention. He further submitted that, with regard to the alleged loss of rent, there was absolutely no evidence to support the claim, as the learned Referee had pointed out in the course of the case. He therefore asked that the judgment should be reversed, or that it should go back to the Referee on the question of evidence,

Mr. STORRY DEANS having added a few remarks on the question of the evidence as to loss of rent,

Justice DARLING asked Mr. Leck what he had to say on the last point—that the Official Referee had no evidence before him, or was not justified, on the evidence he had, in giving anything in respect of loss of rent.

Mr. LECK said the persons who collected the rents were called, and produced the sheets showing week by week whether or not the rent of each house had been received; and some people who had left in consequence of the flood were also called.

Justice DARLING said the appeal must be dismissed. The first ground on which the Court was asked to reverse the judgment of the Official Referee was that, though liability was admitted, it was still necessary for the plaintiffs in each case to prove their title. He did not agree with this. He thought the liability was admitted, not only in the sense that the defendants were liable for negligence to anyone who could prove he had a title, but a general admission that in respect of those particular plaintiffs the only thing to be proved was that damage was done to them. The second point was that damages had been given to the reversioners, and that there was no proof of permanent injury to the reversion. Several cases had been cited, against which no one had a word to say; and he thought the Official Referee was quite justified in coming to the conclusion at which he arrived—that the water did permanent injury to the reversion. If the houses had been let on a 99 years' lease, he should have said there was no evidence of permanent injury to the reversion; but here the property was let to weekly tenants, who might leave at the end of the week, when the reversioner would come into possession, and would find his property in a worse condition because of the water which had got in. The next point was that it was improper to allow anything for loss of rent. But there also he thought the Official Referee had done his best to come to a right conclusion; and there was no reason, on any ground, to interfere with his judgment.

Justice PHILLIMORE said he agreed. The appeal must be dismissed, with costs.

Mr. MAYER said there were some different features in the other case, in which Mr. Roberts was the plaintiff with three others, which he should like to place before the Court.

After some discussion, it appeared that the main point was the question of the plaintiff's right to sue (he being merely the assignee of the mortgagees), and that the previous decision as to the effect of the admission of liability covered it. This appeal was therefore dismissed in the same way.

Mr. MAYER asked leave to appeal; but he was informed that leave was not necessary.

## COUNTY OF LONDON QUARTER SESSIONS.

**Clerkenwell, Monday, April 15.**

(*Before Mr.* ROBERT WALLACE, K.C., *Chairman, and a Bench of Magistrates.*)

### The South Metropolitan Gas Company's Assessment.

At the Sessions House, Clerkenwell, the hearing was this afternoon resumed of the appeal by the South Metropolitan Gas Company against the assessment of their undertaking by the Assessment Committees of the Woolwich Union, the Greenwich Union, the Borough of Lewisham, and the Borough of Bermondsey. It will be remembered that at the conclusion of the third day's proceedings on March 2, the further hearing was adjourned *sine die*. This portion of the case was reported in the "JOURNAL" for March 12 (pp. 693-693).

Mr. BALFOUR BROWNE, K.C., Mr. DANCKWERTS, K.C., and Mr. W. C. RYDE (instructed by Messrs. Budd, Johnson, and Jecks) appeared for the Company. The Counsel for the respondents were: For the Woolwich Union, Mr. CRIPPS, K.C., Mr. HORACE AVORY, K.C., and Mr. E. W. COX-SINCLAIR (instructed by Mr. E. W. Sampson). For the Greenwich Union, Sir RALPH LITTLER, K.C., Mr. MARSHALL, K.C., and Mr. R. C. GLEN (instructed by Messrs. Saw and Sons). For the Borough of Lewisham, Sir EDWARD BOYLE, K.C., and Mr. TYRRELL T. PAINE (instructed by Messrs. Newton, Lewin, and Levett). For the Borough of Bermondsey, Mr. HORACE AVORY, K.C., and Mr. R. W. HARPER (instructed by Mr. F. Ryall, the Town Clerk).

Mr. *Frank Bush*, the Secretary of the Company, who was under examination when the Court adjourned, was re-called, and further questioned by Mr. RYDE. Asked as to how long it took the Company to go round and note the readings of the slot meters and collect the money, he said that particulars had been got out for the four quarters of the account year; and the figures were as follows: The first quarter (Michaelmas), 5 week 5¾ days; the second quarter, 5½ weeks; the third quarter, 5½ weeks; the fourth quarter, 5¾ weeks. The average was 5 weeks 4¼ days. He handed in a table of the weekly receipts from ordinary consumers from July 1 to Nov. 25, 1904 (five months), in response to a request made by Mr. Tyrrell Paine at the previous hearing. The receipts for the first week, ending July 8, were £1658; and the total over the whole period was £345,409. For the first three months, the receipts were practically all for gas sold before the end of the summer quarter, and consequently belonged to the outgoing tenant. He had also taken out a table showing the receipts for four months' residuals; the figures being: July, £40,823; August, £40,669; September, £41,697; and October, £38,242. This was a total of £161,431, as compared with the £168,996 in Mr. Ryde's valuation. The reason for this discrepancy was that Mr. Ryde's figure was for four average months throughout the year.

Cross-examined by Sir RALPH LITTLER: He did not think the Company had ever experienced a decrease in the output of gas in any one year as compared with another. As to the reduction in price to 2s. per 1000 cubic feet having taken place just before the quinquennium, the Directors had the money, and they decided to use it in this way. This seemed to him an excellent reason. Supposing they paid the dividend based on the higher price, there was nothing to prevent the Company charging a different rate in one part of their district as compared with another. He could not say whether there was anything in the Company's Acts which authorized them to charge a differential price. It might cost more to supply gas to some of the outlying parishes. At the last appeal, the Court largely increased the Company's assessment; and shortly afterwards he issued, by order of the Board, the following circular: "In consequence of the large increase in the assessment of the Company's mains in the parish, the Directors regret to give notice that the price of gas will be raised from 2s. 3d. to 2s. 4d. per 1000 cubic feet from the quarterly index-taking at Midsummer." This was sent to the parishes contained in the Union in respect of which the appeal was heard. That judgment gave the rateable value as 15¾ per cent. of the gross receipts; and on the Assessment Committees agreeing to a lower figure—equal to 12 per cent.—the notice regarding the increase in the price of gas was withdrawn. He did not agree that this was a method adopted of defeating the decision of a Court of Justice. The receipts given for 1904, when he was before the Assessment Committees, did not include an item of £54,244 for balance of receipts for rental of fittings, because in discussing the matter with their advisors it was thought that it ought to be excluded. Mr. Ryde's valuation as submitted to the Assessment Committees was about 4½ per cent. on the mains; but he could not say whether Mr. Ryde's result would have been nearly doubled if this £54,244 had been included. He did not know whether it was included or not. At all the Assessment Committees, with the exception of Lewisham, the accounts for 1905 were handed in either by Sir George Livesey or himself; but he believed that all the calculations made by the valuers were on 1904. The gross profit in the

half year to December, 1904, was £172,437; whereas the dividend and interest paid might have been £200,810. The deficit was no doubt made up by drawing £35,782 from the undivided balance. Very likely, at the price of 2s. 3d., the undivided profits in June, 1904, reached £65,375. This had been exhausted; and there was a deficit of £9363 which had been carried forward, in the hope that it would be overtaken by excess profits—during the current half year perhaps. The outlay on repairs and maintenance had not been increased or reduced because of the approach of the quinquennium. The round figures were: 1900-01, £248,000; 1901-02, £260,000; 1903, £278,000; 1904, £302,000; and 1905, £265,000.

Cross-examined by Sir E. BOYLE: The amount outstanding for residuals at June 30, 1904, was £54,000; and it was very likely the whole of them were paid for within two months. To the question whether he did not think it very unfair to charge four or five months' residuals, when they were paid for in two months, witness made no reply.

In answer to Mr. COX-SINCLAIR, witness said the prepayment business first became a substantial part of the undertaking in about 1892 or 1893. Since then it had been progressive; but the present tendency was not to grow so fast as formerly, for the district was gradually becoming saturated.

The re-examination of Mr. Bush was postponed until after Mr. Horace Avory had had an opportunity of cross-examining him.

Mr. *H. E. Jones*, examined by Mr. BALFOUR BROWNE, explained the working of a prepayment meter, and the method adopted of connecting it to the inlet and outlet pipes. He said the whole arrangement was the same as in the case of an ordinary meter—the only difference being the money-box. Witness then handed in his valuation of the undertaking. The net receipts, as per balance-sheet, were £368,997; and adding old rates, parliamentary charges, &c. (£85,902), taken from the expenditure, made £454,899. To this had to be added net income from hire of fittings (after deducting charges for depreciation and upkeep), £42,106—giving a total of £497,005. Deducting rates at 7s. 11½d. in the pound, £63,101, left £433,904, from which had to be taken the occupier's share of £276,152. This left the net rateable value of the whole at £157,752, as against Mr. Ryde's figure of £161,052. Deducting from this £108,678, the agreed value of the indirectly productive portion of the undertaking, there was left a net rateable value of £49,074 to be distributed over the mains. This was equal to 4·13 per cent. of the gas receipts of £1,187,054, or 3·62 per cent. of the total receipts from sales of gas and rental of meters, stoves, and fittings. He did not separate out the renewals as between landlord and tenant, because they both had to come back again in some shape or other; and it saved a good deal of time. They were charged in the accounts; and he dealt with them in the accounts together.

Mr. BALFOUR BROWNE: Apparently the respondents contend that a business quite outside that of gas making—the furnishing of prepayment meters, stoves, burners, and fittings—which brings in a revenue of £54,242, must be brought into the account with the gas business?

*Witness:* Yes; and that is a position which has very much complicated all the discussions here.

They want to bring it in to make it a subject of rating?—Yes; but the whole of it is an independent business, and might be left to a local ironmonger. They have treated all this sort of thing as an outside business; and being very nervous about the extent to which the appliances might remain in popular use, they have taken all the receipts and re-invested them, so to speak, in further things of the kind; and they have created a suspense account. I consider the Company in preparing the accounts rightly excluded the £54,242. Then they come to you with a smaller capital. They were right in that; but the respondents' surveyors would have the income put in. Then if I put that income in, I must charge a proper allowance for depreciation of it, and put back, not the £54,242, but £42,106.

Further examined, witness said it was absolutely necessary, in order to secure the receipts set forth, to have prepayment meters. Eight or ten years ago, they had obtained practically all the ordinary consumers, except for power purposes, which was a new adaptation; and then, by means of the new system, the working classes were brought in. The idea of the Company was not to become owners of these meters and fittings, but to sell gas. The attraction of the business was that it contributed to the general sale of gas. On the question of depreciation of fittings, he differed from Mr. Ryde; his own figure being 40 per cent., as against Mr. Ryde's 50 per cent. His (witness's) total tenant's capital was £1,578,012; and at 17½ per cent., this gave a deduction of £276,152. If a tenant had to borrow this large sum, unless he were a millionaire and could deposit large security, no banker would lend it at under 5 or 6 per cent., because all the security the banker would have would be the gas-works plant in the hands of the tenant. Then, again, the 10 per cent. profit for the tenant included in the 17½ per cent. would certainly not be an excessive amount.

Mr. MARSHALL, in cross-examination: You have made a calculation of the percentage that your rateable value comes out at for the landlord's part of the property; and you have taken, as I understand, what the landlord originally invested in the property. Do you think that is a right way of going about it?

*Witness:* I put down the expended capital of the landlord. That is all the money really at risk.

Supposing £4,000,000 has been spent on a concern years ago, and now it is worth in the market £8,000,000, upon which figure would you calculate your percentage?—Upon the £4,000,000, because that is all that the buildings and plant and things which are the subject-matter of this rating cost.

Cross-examined by Mr. HORACE AVORY, witness said that for the purpose of arriving at his tenant's capital, he had included the things which Mr. Ryde had. He put in everything which was let under the prepayment installation system. Globes were included because they were on the same footing as meters, which in the Lee case were held to be tenant's capital. He could not see any difference for this purpose between a gas-globe and a gas-meter.

Mr. RYDE: I do not want to stop you using an illustration; but I am told there are no globes in the tenant's capital.

*Witness:* It is my mistake. I have not gone into houses and seen what tenants had. I took the Company's returns.

Mr. HORACE AVORY: Give us some idea of the principle on which you say gas brackets or chandeliers ought to be included in the tenant's capital—things which a man could buy at an ironmonger's shop?

*Witness:* Because a man hires them from the Company, just as he hired the meters in the Lee case. Every gas consumer, if he chooses, can get the Company's meter; if he likes, he can get a prepayment meter. If the Company hire the meter to him, they are putting into another landlord's house, and at the service of his tenant, a meter. In the like way, they are putting in fittings, brackets, pendants, and stoves for the tenants' convenience within the building of another landlord upon a special agreement; and the landlord of the works, as such, has no right in the soil or the building where the things are fixed.

Ought gas-engines let out on hire to be included in tenant's capital?—I should think so, if the gas cannot be sold on any other footing.

If you examine your own principle, does it not come to this—you think anything ought to be included in tenant's capital which will in any way promote the sale of gas?

The CHAIRMAN: That is really what Mr. Jones has said.

*Witness:* I meant to say a little more than that. When the Company lend the consumer something which enables him to burn gas which would ordinarily be a consumer's capital, then it is properly included in the working capital of the tenant.

Sir E. BOYLE, in cross-examination, questioned witness with regard to the evidence he gave ten years ago before the Royal Commission on Local Taxation. Counsel read the following quotation: "What do you consider a fair average profit of a gas undertaking on its mere structural cost?—I think I should go as far as to say 6 per cent. on the structural value." Witness, however, pointed out that that referred to the profit of a gas undertaking—not the rateable value.

Sir E. BOYLE: Look at the next question: "Would you allow that for the rating?—For the rating of the whole thing. I venture to say that landlords could be found in abundance only too glad to buy land, to build the works, and to put down plant and the mains for 6 per cent. upon the outlay. In respect of all beyond that, I say you are really trenching on the trade profit of the manufacture." Which clearly shows your 6 per cent. was *quâ* landlord, and landlord only.

*Witness:* That portion.

Six per cent., even on your own calculation of £3,500,000, would bring us home?—This is a general question; here we are dealing with a specific question. That is ten years ago; and there is no contradiction whatever in it.

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**Tuesday, April 16.**

At the opening of the proceedings to-day, a lengthy argument took place with reference to the jurisdiction of the Chairman to hear the case alone—there being at that time no Justice present. It was, however, decided to proceed; and shortly afterwards two Justices put in an appearance.

Mr. *H. E. Jones*, re-called and further cross-examined by Sir E. BOYLE, said that in the valuation of the tenant's working expenses he adopted the sum of £42,000, the co-partnership bonus. He claimed that this was another, and better, form of paying wages.

Cross-examined by Sir RALPH LITTLER: His first experience of rating was at the Epsom Gas-Works; and Mr. Castle came in and increased it. An appeal was unsuccessful; and the rates amounted to 5d. per 1000 cubic feet. As they had only a lease, they could not find this; and they had to raise the price of gas. This was over the whole district. He had not himself known a case of the price of gas being raised in part of a district for this reason.

Re-examined by Mr. RYDE, witness said it was necessary for the incoming tenant to take over the stock of unsold residuals. If at the end of December or June of any year there was a stock on hand, it meant that the Company had been unable to get rid of it at a profit; and if they sold out at a sacrifice, and put the market down, it would damage the incoming tenant. If a tenant started with none at all, it would take some time before he would sell residuals, because the sale was always behind the make. The provision of the fittings (included in tenant's capital) was not a thing out of which the Company directly made much profit; but indirectly they did.

Mr. RYDE: Suppose you could satisfy yourself to demonstration that there was no profit, but that the things balanced, would it still be to the interest of the Company to put their money in these fittings?

*Witness:* Yes; I can give two instances. Two companies, instead of charging 10d., charge 5d. At Eastbourne and Epsom we wished to stimulate the thing; and we placed an insufficient return deliberately on the outlay, so as to get people familiar with the system. It succeeded; and afterwards, when we lowered the price of gas to the ordinary consumer, we did not do so to this class, and thus got things balanced.

Re-examination continued: His reference to 6 per cent. profit in his evidence before the Royal Commission on Local Taxation [referred to the previous day] was only a general answer. As a matter of fact, the profits of the South Metropolitan Company, since the last examination of the assessment in 1895—which was the year before he gave the evidence alluded to—had fallen 2½ per cent.; and if his 6 per cent. was reduced in the same ratio, it would be 4½ per cent. The respondents all complained of a fall in the rateable value; but the profits had fallen much more. In 1880, the profits of the Company came to 17·35d. per 1000 cubic feet, and amounted to 13 per cent. on the capital involved. In 1905, the profits had fallen to 7·6d. per 1000 feet, and to 7·29 per cent. on the capital. This was upon the capital actually expended—the profit on the true capital. In 1880, the Company paid in rates a sum of £15,401, or 1·04d. per 1000 cubic feet; in 1905, they paid £80,255, or 1·59d. per 1000 feet. The actual contribution to the rates out of each 1000 cubic feet of gas was thus 60 per cent. more now; while the price of gas had gone down from about 3s. to 2s.

Sir *George Livesey*, examined by Mr. DANCKWERTS, said that the Company never had any trouble with their assessment until 1880. He explained the sliding-scale principle under which the Company worked, and remarked that he appeared there 6½ parts representing the consumers, and 1 part only the shareholders. In fact, the consumers had had the full benefit of the last reduction in price; the proprietors not having had the additional dividend to which they were entitled.

When the sliding-scale came into action (1876), gas had a substantial monopoly; but going back to 1866—the time of the decision in the Lee case—it had absolutely no competitor whatever. In 1875, mineral oil had come in; and now, of course, there was electricity. Theoretically, this should depreciate the value of gas undertakings and increase the tenant's risk. In a sense, the value had decreased, because gas undertakings had not the same prospects or profits that once existed. They had therefore had to strike out in new directions—power and heating and slot meters; and they had to find the necessary apparatus, as the public would not do it. The result had been a very large consumption. The slot-meters alone—taking them at 200,000, with an average consumption of 18,000 cubic feet each—accounted for over a quarter of the total output of gas. The number of stoves let to ordinary consumers in the account year was 68,638; and the average consumption for each of these was probably over 25,000 cubic feet. Adding to these the gas engines and fires, more than half of the total sales of gas was accounted for. As to prepayment installations, they included everything—fittings, burners, and globes. The Company did not, however, replace broken globes. The slot-meter business was entirely the hypothetical tenant's affair. The saturation point must be approaching, in respect of prepayment installations; and then the Company would have to depend for increases solely on new buildings. Of the ordinary consumers, about 80 per cent. now had cookers. The Company's district was, of course, mainly one of small people. The 17½ per cent. profit was right when it was fixed in 1866; but it was not enough now. A hypothetical tenant must raise the money on the market; and it seemed to witness that the risks were too great to enable this to be done at a low rate. His own idea was that the 17½ per cent. was fixed in order to put gas companies somewhat on an equality with the ordinary trader, so that the rating should be as nearly as possible the same—and nobody doubted that the ordinary trader made at least 10 per cent. on his capital. Probably he turned his money over twice a year and made 20 per cent. profit, besides his interest. In view of the risk of explosions, fires, strikes, accidents, &c., he did not think 2½ per cent. on the tenant's capital was any too much provision to make. Then the tenant would have to spend a large sum on prepayment meters, for which he would get a much smaller sum at the expiration of his tenancy. This depreciation would represent another 2 per cent. at least. He did not think the tenant would by any possibility borrow his money at 5 per cent. The remaining 10 per cent.—though there would not be anything like it left—was given him for profit.

The CHAIRMAN: If it were a small business, 10 per cent. would be absurd; but take a large consolidated business producing a very large profit, would not a man think himself well off in getting 5 per cent. on the capital he borrowed and 10 per cent. for himself?

*Witness:* If he was sure of getting it. It is a matter of opinion whether 17½ per cent. is sufficient to tempt a man into the business or not. I do not think it is too much; but I wish to say that there is no reason why gas should be higher rated than anything else. I have particulars of a number of ordinary traders; and I find the average proportion the rates bear to their sales is under 1 per cent., while with gas companies it is 6 per cent. Out of the 17½ per cent., the tenant would have to provide a contingency fund. I do not know how he could; but he must have it to meet possible loss.

Mr. DANCKWERTS: You have already said that the net profits of the Company, relatively to the gross takings, are decreasing?

*Witness:* Certainly, very materially. Whereas in 1880 it took 14½d. per 1000 cubic feet to pay the dividend, in 1905 it took rather less than 8d. Whereas the amount of money divided increased 61 per cent. in the twenty years, the amount of assessment increased 65 per cent., and the rates 150 per cent.

Some people have been good enough to accuse you of a policy that I do not wish to characterize by name; but they say that you have a pleasant little habit of reducing the price of gas in anticipation of a quinquennial. Is it true?—I am quite prepared for that suggestion.

Have you ever advised your Company to be influenced in putting down the price of gas by the anticipation or the existence of a quinquennial re-assessment?—No, because of a superior reason for reducing the price. Our policy has been to reduce it whenever we can. We do not work this Company for the rating authorities, but for the consumers, shareholders, and employees. I will say further that the price of gas will be raised again in the middle of this winter. We have struggled hard to keep it down, but coal has risen, and the price of gas must go up this year.

You have something to say about the practice of surveyors in charging a fixed sum on works?—That bears on the question that has been raised here, that if the slot-meter business goes on at the present rate it will extinguish—which, of course, I deny—the rateable value of the mains. In deciding the total rateable value between works and productive mains, the works get too much and the mains too little—particularly when the works are constructed with cheap capital.

Examination continued: As to the sum of £54,244 for rental of fittings which Mr. Bush said was not included in the accounts, it was not a revenue receipt at all, because it was used to pay off or to depreciate the capital expenditure on stoves, slot meters, fittings, &c. This sum was the surplus of the extra 9d. per 1000 cubic feet charged to the consumers. Part of the 9d. was for meter and stove rent and other things; but there was a balance of £54,244 which was used to reduce the suspense account. This suspense account was the capital invested in the slot-meter business, which it was intended to liquidate, instead of making a permanent charge. Mr. Bush was perfectly right in saying it was not a revenue account at all. It was redemption of capital. The development of the last ten or fifteen years had been in the direction of a tenant's business. In fact, he thought the Company would have stood still but for the development experienced in the tenant's business.

Cross-examined by Mr. CRIPPS with regard to his table relating to the price of gas and coal and the dividends paid and payable, witness admitted that in the quinquennial year of 1889 they had the lowest price of gas which had up to that date been charged by the Company—2s. 3d. There was a large deficiency that year directly attributable to the strike. The price was reduced because there was a large surplus in 1888. In the last half of the next quinquennial year—1894—the price was reduced to 2s. 4d., which was the lowest figure since it had gone up from 2s. 3d. to 2s. 6d. There was a surplus which showed that at the lower price they could make ends meet. Then, again, in 1889, from Midsummer they had the price down to 2s. 1d. This, however, was only a little lower than the 2s. 3d. in 1889, as the quality of the gas had been reduced from 16 to 14 candles. There was a deficiency in the last half of that year, solely due to the increased cost of coal. By the middle of 1901, the price had increased to 2s. 8d.; and then it gradually came down until in the latter part of 1904 (the quinquennial year) the record low price of 2s. was reached. The explanation of this was that there were large surpluses in 1903 and the first half of 1904. In the second half of 1904 there was deficiency of £35,664, which took them very much by surprise, and was due to a great and sudden drop in the value of coke. Less than the average was charged for repairs that year. If they had a bad year, they put off any repairs they legitimately could, in the hope that a better time might come. They worked fairly close to the grindstone in the price of gas.

Mr. CRIPPS: Your Company are asking, of course, for Mr. Ryde's figure?

*Witness:* Mr. Ryde has put in his valuation.

Supposing you find that the figure asked for works out that assessments have been going rapidly down while profits have been going rapidly up, would that bring to your mind that the solution was a fair one?—Yes, it would, because the assessments of gas are excessive; 7 per cent. on the price of gas is outrageous.

Supposing it were shown that while the profits of a company were largely going up, the assessment was largely going down, would that suggest to you a fair solution?—It would suggest to me an approach to justice in this matter.

Cross-examination continued: The Company had no penny-in-the-slot meters without piping and fittings; but there were a few shilling-in-the-slot meters supplied in place of ordinary ones. To secure the custom of the working classes, it was essential to supply the fittings; but, of course, they need not have gone into this business.

Mr. CRIPPS: Is not this 17½ per cent. a mere archaism?

*Witness:* You reduce it to half; and the effect of that would be to increase the burden on the consumer to about double what he now pays for rates. The gas consumer is the most unfortunate individual in the kingdom. I always took the 17½ per cent. to put the gas company somewhat on a level with the ordinary trader—not to make him pay more rates. An ordinary trader would make 20 to 25 per cent. on his capital.

Mr. HORACE AVORY asked witness whether it was not a fact that the Company had settled with Rotherhithe on the basis of 9½ per cent. on the gross receipts.

Witness replied that the settlement was very near Mr. Ryde's figures, which worked out at 4½ per cent. for the productive mains. The difference was that the Committee's valuer put the works at a lower figure than Mr. Ryde; and this left him with a larger balance for the productive mains.

Mr. HORACE AVORY: The works are taken in the agreed figures at £8500. Taking them at that, the productive mains work out at 9½ per cent.

Cross-examined by Sir RALPH LITTLER: He had been obliged to take a very active part in all the appeals since 1880. In that year the rateable value of the mains in the parish of Bermondsey might have been fixed at 18 per cent.; but all the others were settled at a great deal less. In 1885, a settlement was made at a high figure—16 or 17 per cent. In 1890, the Unions recognized the Company's strike trouble, and reduced the figure to 10 per cent. In 1895, he felt certain the assessments were all increased. Several of the parishes put the figure up from 10 to 12 per cent. There were some appeals; and the Court gave a figure of something like 15¾ per cent. On that, the circular notifying an increase in price in the parts of the Company's area affected was issued; and the Unions concerned thereupon reduced the assessment to 12 per cent. The notification was then withdrawn. He did not know that he could point to any case in the whole of the country in which a gas company charged differential rates, except where they had authority to do so by Act of Parliament. He did not say that, if the result of the present appeals was to raise to an excessive amount the rates in the three or four parishes concerned, they would increase the price in those parishes; but they would be perfectly justified in doing so. There was no law against it; and they would pay a less dividend than they were otherwise entitled to. When the Company resolved on appealing, they retained several valuers who had acted for other parishes and had estimated the proper amount of assessment at 7½ per cent. The respondents could not have retained them, because they would have gone against them. Of the three London Companies, the South Metropolitan was assessed lowest per 1000 cubic feet, because their gas was cheaper and their profits less.

Sir RALPH LITTLER: I should like to have a word with you about the profits earned. In 1895, you had £329,000 profit; and the same in 1896. In 1897, it got up to £336,000; and in 1898, to £380,000. Then there was a drop. In 1899, being the account year, it was £353,000. It then went up again to £377,000. In 1903, it went up to £447,000, but again dropped in the account year to £396,000; and in your account year (1904-5) it dropped to £369,000. Is that so? I find that, immediately after your account year, the profits earned jumped up to £384,000 in 1905, and to £399,000 in 1906?

*Witness:* Yes.

Who is responsible in your Company for the division of expenditure between capital and revenue; who decides it?—Every half year all the doubtful items are submitted to me and one or two other Directors, in conjunction with the two chief officers. If it has been a good half year, we carry as much as we can to revenue.

Cross-examined by Mr. TYRRELL PAINE, witness said his view was not that the hypothetical tenant would want to take over the stock of residual products, but that he would have to do so. If the undertaking was sold, the basis would be so many years' purchase of the dividend.

Re-examined by Mr. RYDE: In the case of a sale, it would be the dividend, and not the capital, that would be the factor. The effect of translating £1,000,000 of 10 per cent. stock into £2,000,000 of 5 per cent. stock would not make a farthing difference to the price they would expect to get.

Mr. RYDE: I must ask you some questions about the point Mr. Avory seems to attach importance to—about the settlement come to in Rotherhithe.

The CHAIRMAN: How does that affect the question here? If other Unions have given away their privileges or exceeded them, it would not affect my judgment.

The CHAIRMAN (to witness): At the time that these reductions in the price of gas were made at the quinquennial period, did the Company pay the full dividend that was allowed by law? Is it a fact that practically on every occasion except one there was a deficit dividend?

*Witness:* In the first one—1886—we paid full dividends. Then from 1893 right on to 1899 we were not paying full dividends. I may say this shows we have not been greedy after full dividends.

The CHAIRMAN: No; I was not suggesting greed. I want it for other reasons.

The hearing was then adjourned; and the case will be resumed on Monday, the 29th inst., and probably the following days.

## ESSEX QUARTER SESSIONS.

### Chelmsford, Friday, April 19.

(*Before Mr.* E. NORTH BUXTON, *Chairman, and a Bench of Magistrates*)

### Assessment Appeal by the Southend Gas Company.

To-day certain appeals entered by the Southend Gas Company against the assessment for poor rates of their property in the parishes of Prittlewell and Southchurch, in the Rochford Union, were heard by the Court.

Mr. W. C. RYDE and Mr. C. M. KOASTON (instructed by Messrs. Wood, Son, and Langton) appeared for the appellants; Mr. HORACE AVORY, K.C., and Mr. E. J. NALDRETT represented the respondents—the Assessment Committee of the Rochford Union.

Mr. RYDE said the appeal was against the rates made in November last year. The figure in the valuation list for Prittlewell was £11,000 gross and £6149 rateable value; this parish containing the whole of the gas-works, mains, and pipes. When an objection was laid before the Assessment Committee, a reduction was made to £9278 gross and £4120 rateable value. There was also in Prittlewell an assessment on the offices and show-room—£120 gross and £96 rateable. In order that the whole matter might come before the Court, this assessment had been included in the notice of appeal. In Southchurch, the Overseers had put an assessment on the mains, service-pipes, &c., of £2000 gross and £1197 rateable value. The Committee afterwards reduced these figures to £1700 gross and £880 rateable. The total figures gave an assessment on the whole undertaking of £11,098 gross and £5096 rateable. It was this latter aggregate the Company sought to have reduced. Counsel pointed out that of late years gas companies had been obliged, in addition to simply constructing gas-works and laying down mains, to provide service-pipes and fittings in the houses of artisans who became customers. As the artisan was not a class of man to whom a quarter's credit could be given, a system of supplying gas through penny-in-the-slot meters was necessary. Consequently the money which a gas company had to put into their business was very largely increased in respect of these meters. The ordinary consumers of the Southend Company numbered 3414; but prepayment meter customers numbered 6047. He wished to point out that the latter consumers were two-thirds of the entire number; and the total quantity of gas they consumed was small in proportion to that supplied to the ordinary customers. Counsel next pointed out that £69,431 was the amount of the capital expenditure, and that the gross receipts were £50,000 a year. It was, therefore, necessary to see what profit a hypothetical tenant would make, in order that they could find what rent he would be likely to pay for the works. The net profits of the Company amounted to £12,000.

Mr. *Ryde*, a member of the firm of Messrs. Ryde and Sons, said he had valued the Company's undertaking at Southend for rating purposes. The great advantage of the penny-in-the-slot meters was that they had enabled the Company to supply a new class of customer with gas for heating and lighting purposes. This was particularly the case at Southend, where there were so many lodging-house keepers. He put the gross value of the undertaking at £10,946, and the rateable value at £3970.

In cross-examination by Mr. AVORY, witness said he was aware that at the last valuation, in 1902, the rateable value was fixed at £3638, and that the Company took no steps to appeal against it. He also accepted Counsel's statement that up to June, 1902, the meter supplies brought in £33,889, and that by the end of June, 1906, they had increased to £48,719. He also accepted the calculation that, whereas in June, 1902, the profit on the Company's revenue account worked out at £9735, in June, 1906, it had risen to £14,740. His rateable value of £3970 represented about 8 per cent. of the £50,000 gross receipts. Answering other questions, the witness did not dissent from the statement that, whereas in 1877 the capital of the Company was £20,000, it now stood at more than £300,000. He valued the works at £78,000, and the land at £7500. He admitted that since 1902, according to what he was told, £9317 worth of land had been acquired; that new buildings, plant, and machinery had been added, to the extent of £34,099; and that new mains had been laid at a cost of £25,124. He suggested that a hypothetical tenant, who made £12,075 out of the business, would have it let to him at £3970.

Mr. *R. Vigers*, of Messrs. Vigers and Son, gave evidence supporting that of the preceding witness.

Mr. *H. E. Jones* followed to the same effect. In cross-examination, however, he said it would be better to rate gas-works at a certain percentage on their structural value. He had advocated 6 per cent.; but in the present case he thought 4 per cent. would be sufficient. His estimate of the structural value of the Company's works, land, and mains came out at £124,500.

Mr. AVORY remarked that 4 per cent. on these figures would show a rateable value of £5000. He then proceeded to address the Court on behalf of the respondents. He particularly drew attention to the circumstance that the penny-in-the-slot meters were now being used to swell the capital of the hypothetical tenant in such a way that in a very short time the valuation of a gas-works would work out at nothing. This must, he said, be the ultimate result; and it was a point upon which his learned friend was exercising the mind of more than one Court in the country. The figure of the Assessment Committee must be well within the mark, as it was £1500 less than that of their own valuers. In pointing to the large increase in profits, from £9735 in 1902 to £14,740 in 1906, Counsel mentioned that the rateable value now fixed by the Assessment Committee was only 33½ per cent. on the net revenue; whereas in 1902 it was 37 per cent. It was absurd to think that if a concern like this was in the market, a tenant would only pay a rent of £5096 for it. Taking Mr. Jones's figures of the structural value of the business, the annual value, at 4 per cent., worked out at £5000. Under these circumstances, he contended that the valuation of the Committee was by no means excessive.

Mr. *Dinwiddy* was the only witness called for the respondents; and he put the value of the Company's property at £6639.

In the result, the appeal was dismissed with costs.

## Ipswich Gas Company's Assessment Appeal.

In the King's Bench Division of the High Court of Justice on Friday, before Justices Darling and Phillimore, Mr. Jeeves applied, on behalf of the Assessment Committee of the Ipswich Union, that the time for lodging a special case might be extended till the 18th of October, under the following circumstances: The Gas Company had appealed against their assessment, and after the case had been heard the Recorder gave judgment in their favour, subject to a special case, for which the Company asked, being prepared. [See "JOURNAL" for Oct. 23, 1906, p. 255.] This case was to be settled by Counsel. After giving judgment, the Recorder resigned his appointment owing to ill-health. The Assessment Committee had prepared the case, and submitted it to the Company, who made various alterations which were not agreed to. As it was undesirable to refer the case to the Recorder to settle, as he was still very unwell, it had been suggested that Counsel on both sides should meet and settle the case. Mr. Walter C. Ryde, who appeared for the Company, assented to the arrangement proposed; and their Lordships extended the time till the date named.

## Cardiff Water-Works Assessment Appeals.

At an Adjourned Quarter Sessions for the County of Brecon, held on Wednesday last, a case came on for hearing in which the Cardiff Corporation were the appellants and the Assessment Committee of the Brecon Board of Guardians the respondents. It was an appeal against the assessment of the water-works of the Corporation located in the Brecon Union. Mr. J. Sankey (instructed by Mr. J. L. Wheatley, the Town Clerk of Cardiff) appeared for the appellants, Sir Edward Boyle, K.C., M.P., and the Hon. H. C. Bailey (instructed by Mr. M. F. Thomas, the Clerk to the Board of Guardians and the Assessment Committee) represented the respondents. Mr. Sankey said the first appeal was against the rate made for the parish of Cantreff in respect to the works situated in the parish. The rateable value of the reservoir had been put down by the respondents at £4825, and the conduit at £180; so that the rate appealed against was £5005. With respect to fair structural value, he contended that they must not take the amount actually expended, as the appellants were entitled to a number of deductions. Evidence was called; but subsequently the parties came to terms with respect to the appeal partly heard and the appeals to follow. The result is that the assessment of the reservoirs, &c., in the various parishes is reduced by £843. The assessment of works, &c., located in the parishes of Modrydd and Glyn are lowered from £6910 to £6550; the reservoir in the parish of Cantreff, from £4825 to £4380; and the conduits, from £180 to £150.

**Increased Water Storage for Leeds.**—At last Friday's meeting of the Water Committee of the Leeds Corporation, an important step was taken in connection with the new water-works scheme. It was a decision to advertise for tenders for the construction of the Leighton reservoir—an undertaking which is roughly estimated to cost £450,000. A start was to have been made with the Colsterdale reservoir; but various defects were discovered, and the scheme was altered. Until parliamentary sanction has been obtained for the changes proposed, this must remain in abeyance. In the case of the proposed new Leighton reservoir, however, a commencement can be made very soon. Though some of the reservoirs have been constructed by administration, it is not understood to be the intention of the Committee to do the work themselves in this case. Their Engineer advises them that it will be better, having regard to the difficulties of the task and the magnitude of the undertaking, if, with the other works the Corporation have in hand, they let it by contract.

**Costs of the Opposition to the Falmouth Gas Bill.**—A special meeting of the Falmouth Town Council was held on Thursday to pass a resolution charging on the rates the expense of opposing the Falmouth Gas Bill. Mr. E. Williams said that the members had received a circular stating that a letter had been written to the Chairman of the House of Lords Committee by the Mayor (Alderman Grose) in regard to the Bill; and he asked if the Mayor wrote the letter in his official capacity. The Mayor replied that he wrote entirely on his own account. He was prepared to meet Messrs. Baker and Co. (the Gas Company's Parliamentary Agents), and single handed he would fight the battle to the death. Mr. Williams thought the Mayor had acted in a spirit of vindictiveness to the Company, and was not worthy of the position he held. The Mayor said no one could stop the Mayor of Falmouth going to London and acting as Mayor. The resolution was passed; and it was decided to inform the Company that the Council had no association with the letter to which reference had been made.

# MISCELLANEOUS NEWS.

## MANCHESTER CORPORATION GAS SUPPLY.

### Past Year's Working—Estimates for 1907-8.

The Gas Committee of the Manchester Corporation, at a meeting held on Monday last week, settled their budget for the current year. The estimated income in the twelve months ending March 31 last was £696,000, the expenditure £556,700, and the gross profits £139,300; but the actual figures were £731,840, £567,212, and £164,628. The interest on loans, estimated at £44,500, came to £46,413; and sinking fund payments, reckoned at £34,735, took £56,111. Consequently, the surplus was £62,104, instead of the £40,065 estimated. There was paid into the city fund during the financial year £60,000, free of income-tax; so that there was left a balance, after amply providing for renewals of plant, of £2104 to go to the reserve fund, which at the close of the year amounted to £61,127. The total sum paid out of the gas profits in relief of the rates from 1844 (the year in which the gas-works were acquired by the Corporation) to March 31 last is £2,808,584. With regard to the current year, the estimated surplus on the revenue account is only £20,677, owing to the prospective increase to the amount of £40,000 in the cost of coal. The estimated expenditure on capital account is put down at £84,120, compared with £58,753 in the twelve months just closed—a difference of £25,367. In it, however, is included the first portion of the outlay on the large gasholder which, subject to the sanction of the Local Government Board, the Gas Committee have decided to construct at Bradford Road, and further outlay on the completion of the remaining half of the retort-house at the Gaythorn Station. The capacity of the holder will be about 10 million cubic feet, or 3 millions more than that of the present largest holder possessed by the Corporation. It is purposed to make a further payment of £50,000 into the city fund during the year ending March 31, 1908; but, in order to do it, £29,323 will be taken from the reserve fund. It is estimated that the street lighting will cost £56,595 this year, against £59,805 in the twelve months just closed.

## NOTTINGHAM GAS INQUIRY.

### Ninth Day's Proceedings.

The Committee of the Nottingham City Council appointed to inquire into the working of the gas undertaking during the past five years, held their ninth meeting on Friday; and at the close of the proceedings, it was announced that, unless something unforeseen happened, only one more sitting would be necessary. The members of the Committee are: The Mayor (Alderman J. A. H. Green), Mr. E. L. Manning, Mr. S. Cook, Mr. E. N. Elborne, and Dr. Dabell.

The MAYOR remarked that the Committee wished to obtain a comparison of the Nottingham gas undertaking with those of other towns, whether managed by the corporations or by companies; and for this purpose he thought they might take the last published records in "Field's Analysis," which was for the year 1905. Further, they desired to get a comparison of the relative progress or otherwise made by their own and other undertakings over a period of years. They would take the figures per 1000 cubic feet; and for the purpose of rendering the comparisons easier to understand, it might be said that 1d. per 1000 feet on the quantity of gas consumed in Nottingham during 1905 would yield an income of £7700. They might well begin with that most fortunate of places Sheffield, whose undertaking was managed by a Company.

Mr. *J. H. Brown*, the Gas Engineer, then submitted the following figures: The candle power supplied for the year ending March 31, 1905, was: Nottingham, 16·50; Sheffield, 17·37. The miles of mains: For Nottingham, 351 miles; Sheffield, 538 miles. Consumers per mile: Nottingham, 174; Sheffield, 146. Quantity of gas made: Nottingham, 2000 million cubic feet; Sheffield, 3000 million feet. The amount of gas purchased per consumer: Nottingham, 28,860 cubic feet; Sheffield, 33,253 feet. Cost of coal per 1000 feet of gas: Nottingham, 11·25d.; Sheffield, 8·1d. Amount realized for residuals: Nottingham, 8·14d.; Sheffield, 10·21d. Net coal per 1000 feet: Nottingham, 3·11d. debit; Sheffield, 2·11d. credit—or a gross difference of 5·22d. per 1000 feet. When Sheffield bought its coal and made its gas, the residuals gave a profit of 2·11d. per 1000 cubic feet. The total manufacturing charge for Nottingham was 9·19d.; and for Sheffield, 7·52d.—including an item for wear and tear. The distribution charge totalled 5·26d. for Nottingham, and 2·32d. for Sheffield—again including wear and tear. The Nottingham revenue from meters was 0·88d., compared with 1·22d. for Sheffield; while the stove-rental was 0·52d. for Nottingham, and 0·16d. for Sheffield. These items were included in the 5·26d. total Nottingham distribution charge. The management charge for Nottingham was 1·14d., and Sheffield 0·99d. The net cost of coal and working expenses was 20·81d. and 10·56d. respectively. Nottingham had a very extended area to serve. Witness then gave further figures showing that in 1892 Nottingham was making its gas practically on the same terms as Sheffield. In 1893, the advantages in the net coal and working expenses had become 0·81d. per 1000 cubic feet in favour of Nottingham. For the following year, the charge in Nottingham was 19·79d., and Sheffield 15·47d.; the tables having been turned in an advantage to Sheffield of 4·32d. In 1895, the difference was less; but after this period Nottingham never got near Sheffield again. The following year the advantage was 3·22d. in favour of Sheffield; and in 1897, it was 4·60d. In 1898, it was 4·44d.; in 1899, it was increased to 5·70d.; and then to 4·13d. In 1901, it was 5·35d.; and in 1902, the last completed year before witness came, it had risen to the extraordinary difference of 10·37d.—26·06d. to 15·69d. In 1903, it was still worse—Nottingham 24·03d., and Sheffield 13d.; the difference in favour of Sheffield being 11·03d. In 1904, the figure was 9·72d. against them; and in 1905, 10·25d. Sheffield had several advantages over Nottingham. It was placed more advantageously than any other undertaking in the country—in the centre of the best gas-producing coalfield. Sheffield also held a unique position with regard to the sale of its residuals; practically the whole of the coke produced being taken by the local iron and steel industries. Sheffield purchased coal shillings below the gas-producing coal in Nottingham. As to coke, Nottingham made practically 75,000 tons for sale, only 17,000 tons of which were sold in the city. Then the Sheffield output of gas was 50 per cent. more than that of Nottingham, and, consequently, they were able to make it cheaper. The works, too, were put down on a much more liberal scale.

The MAYOR: Did not all these circumstances exist in the year 1892? Is there any reason why we should not get back to the position we held in regard to Sheffield in that year?

*Witness* replied that they could not hope to compete with Sheffield, because of the advantage they had in being able to obtain a first-class bituminous coal at practically one-half the price which had to be paid in Nottingham. Up to 1892, Sheffield was using practically the same kind of coal as Nottingham; but now they were employing a small coal which they obtained at a very low price. He then gave further figures comparing the two undertakings. Taking the published accounts for Nottingham, at March, 1906, and comparing them with the corresponding period for Sheffield, ending December, 1905, the average price of gas in Nottingham was 12·78d. more than in Sheffield; and the gross profit per 1000 cubic feet was greater at Nottingham than Sheffield by 4·33d. In 1905, the comparisons of candle power were: Nottingham, 16·50; Sheffield, 17·37. The comparisons in the sale of residuals were: 1892, 1·67d. against Nottingham; in 1902, 1·47d. against Nottingham; and in 1905, it had become 2·07d. against Nottingham. Manufacturing charges had changed from 2·21d. in favour of Nottingham to 0·83d. against them in 1905. More repairs and reconstructions were undertaken during that period; and in the meantime Nottingham had been adopting machinery for all the retort-houses. This meant more wear and tear; but, on the other hand, the carbonizing charges were reduced by it. Wages conditions in Nottingham were more favourable than in Sheffield.

The MAYOR: I venture the suggestion that, from the look of things, in 1902 matters had been allowed to go their own sweet way for some time; and therefore the cost of wear and tear in your first three years was much above the average.

*Witness:* Much above; and we have not yet got down to a normal figure.

In answer to further questions, witness said that, while at Sheffield there were demands for gas during the day for power purposes, which rendered it unnecessary for the Company to pay much attention to stoves, Nottingham was bound to cultivate a day load by the use of cookers. Similar comparative figures with regard to other gas undertakings were then dealt with. Continuing, witness said that if there was any doubt as to whether expenditure should be charged to capital or revenue, the matter was referred to the Committee; but it was generally left for him to decide. The line of demarcation was usually perfectly clear. He did not think that, without the fact showing itself on the balance-sheet, it would be possible to increase or diminish to any extent the profit on a year's working by the arbitrary placing of expenditure to one or the other account.

The MAYOR, having examined the balance-sheet, said he found that the amount of coal received during the year and that of the previous stock aggregated within a ton of the amount of coal consumed in the retorts and burned in other ways during the year and that estimated to remain in stock at the end of the year. He thought this was very close reckoning.

*Witness* replied that it was the usual custom to make the estimate of stock remaining balance up the amounts for the year.

The inquiry was then adjourned until next Thursday.

## ASSOCIATION OF MUNICIPAL CORPORATIONS.

### Annual Meeting.

The Annual Meeting of the Association was held last Thursday at the Guildhall; there being a large attendance of representatives from county and non-county boroughs. The Lord Mayor (Alderman Sir W. P. Treloar) occupied the chair at the commencement of the proceedings; and after cordially welcoming the delegates, he proposed (and it was unanimously agreed) that Mr. J. HARMOOD BANNER, M.P., of Liverpool, should be the President of the Association for the present year. Mr. A. H. Scott, M.P. for Ashton-under-Lyne was elected Vice-President.

The PRESIDENT then took the chair; and after returning thanks for his election, acknowledged the kindness of the Lord Mayor and the Corporation of London.

Mr. A. H. SCOTT, in thanking the Association for selecting him as Vice-President, said he was convinced that the great objects that municipalities felt so keenly about, were to be achieved by the municipalities themselves, and not by Parliament. He believed that by their united activities they would not only secure greater liberties for municipalities, but would prevent them from losing the liberties they at present enjoyed.

#### PARLIAMENTARY WORK.

The PRESIDENT, in proposing the adoption of the report and accounts, remarked that among the principal matters to refer to was first of all the enormous number of Bills which came before the Association—and especially before the Law Committee. There were last year about eighty Bills altogether that came before them, though the number that received the Royal Assent was, of course, considerably less. The duties of Parliament were becoming year by year, as regarded Bills, more exacting; and therefore they relied upon Associations like themselves and others throughout the country to assist in making these Bills as perfect as possible. He did not refer to Government measures; but many other Bills came forward in a very abstract form. Thus it was extremely valuable to Members of Parliament that there was a

Committee like the Law Committee, and an Association like theirs, to put the Bills into shape, so that, when passed, they might be of some use. Year by year, he was afraid, they would find the Bills were presented in this abstract form, and would require more and more the services of the Association.

### The Audit Question.

With regard to the auditing of municipal accounts, as Chairman of the Finance Committee, and as a professional Accountant, he had had considerable experience of the way things were done in Liverpool, as well as other towns. The first thing he had to do was to express his regret that no action had been taken, either by the late Conservative Government or as yet by the present one, to deal with the recommendation of the 1904 Joint Committee on Municipal Trading. The principal object of the recommendation was to suggest the appointment of professional auditors—members of any of the established Associations of Accountants—in place of the present elective auditors, and certainly in priority to any appointment by the Local Government Board. He was afraid that, unless the Association used their great influence further than by recording the resolution that was passed in December, 1904—which read: "That the Government be requested to give effect to the report of the Joint Committee with respect to municipal audit at the earliest possible date"—they would find themselves shortly under the heel of the Local Government Board. It was not a question of politics, both sides were alike blameable. While he fully recognized the great integrity of the permanent officials of the Local Government Board, yet they still had it in their minds that perhaps these gentlemen looked on matters in rather a stereotyped manner, that they had no commercial experience, and that they were rather apt to take a hard-and-fast line which (especially in these days, when they went in for municipal trading) was quite contrary to the ease and facility with which they all desired to conduct their business. This fear was justified by one or two instances, and especially by the fact that an independent audit was not receiving the full consideration which the report of the Committee deserved. There was the refusal of the Board, through their auditors, to pass the subscriptions which had been paid by some of the London Boroughs towards the Association; and he did not think he was unduly elevating the Association when he said that a subscription to it could not possibly be considered an unnecessary expense, but, on the contrary, was a most desirable one. He thought the fact that the Local Government Board Auditor had declined to pass these subscriptions in the case of the London Boroughs was an illustration of the hard-and-fast way in which the audit was conducted. Representations were made some time ago, and he believed the payments were afterwards allowed; yet the same difficulty was taking place again now. He did not think they ought to be expected to go to the Local Government Board to ask them to revise the disallowances of the auditor. Next, in the Unemployed Workmen's Act, 1905, section 4, the Local Government Board were empowered to make regulations for the audit in the same manner as the audit of accounts of a county council; and therefore they were to be under the control of the Board, though they ought to be capable of managing this little affair themselves. They were all glad to receive contributions for the aid of the Distress Committees; but there was not such a large amount as to need a special auditor to control the expenditure. In the Municipal Milk Depôts Bill, there was the same provision for Local Government Board auditors, though the expenses came out of the general district rate. In Mr. Haldane's Territorial Bill, there was the same provision, which showed that there was a tendency for the Local Government Board auditor to be imposed upon them wherever it was at all possible. They were all of them looking forward to the report of the Committee presided over by Mr. Runciman with some apprehension lest they recommend the same system of audit. They, however, hoped this Committee were going to give them some method of accounts which would be plain and intelligible to everybody, and would also show clearly the true position of the municipalities. He believed the municipalities were a considerably richer and more solvent body than the public believed; and a proper form of accounts would show this. With these instances before them, he did not think they would regard it as inappropriate that he should refer to the question of audit. Everything indicated that they would have to exert themselves if they intended to keep their expenditure out of the control of the Local Government Board. This was the more necessary seeing that, as he had already mentioned, they were now undertaking so much municipal trading. If they were to compete equally with other trading communities, they must not be hampered by the fear that proper expenditure would be disallowed by the auditor. There were four forms of audit. First, there was the internal audit; and he would recommend all the municipalities who could stand the expense to have a very close form of internal audit, which meant to a very great extent audit before payment. Then there was the elective auditor. He was extremely valuable in checking tea money, lunch money, and other payments of that description; but as he was generally appointed on a political basis, he did not carry that weight with the community which perhaps his report deserved. Next there was the Local Government Board auditor, who was of use in looking after the pence, without looking after the pounds. He could not see that this had very great advantages. Lastly, there was the professional audit, which was the one thing that gave confidence. It was so purely non-political that no one could possibly ascribe any bias to it. He pointed out that the Association represented 295 towns, and concluded with an appeal to Members of Parliament to see that some steps were taken shortly to prevent the municipalities coming entirely under the control of the Local Government Board, and to carry out the recommendation of the Joint Committee.

Mr. J. Parker, M.P. for Halifax, seconded the motion, which was carried.

### Repayment of Loans.

Alderman G. H. Smith, of Halifax, moved that: "In the opinion of this Association it is desirable that the Public Health Act, 1875, section 234 (4) and Standing Order 173*a* of the House of Commons should be amended so as to allow local authorities a term of sixty years at least for the repayment of moneys borrowed for the purchase of land for water-works and the construction of such works, and forty years at the least for pipes, machinery, and other appliances applicable to such water-works, and that the Council be empowered to take the necessary steps to give effect to this resolution." He said that he had been requested by the County Borough of Halifax to propose this resolution, for which he was quite sure he would receive the generous support of those present. They all of them contended that there was no greater necessity for any town or community than a good supply of fresh and pure water. They in the manufacturing districts of Yorkshire needed a great deal of water for trade purposes. Realizing in Halifax this necessity, they had provided themselves with twelve big reservoirs; and they thought that for many years to come they would have an abundant supply. But a few years since they found that, after they had had a dry season, they were actually within three days of the end of their supply. Therefore they considered it was time to begin to increase their reservoirs, so that a period of real want of water should not arise within their district. They commenced the construction of what were known as the Walshaw Dean works. They obtained a loan of about £157,000 at 48 years; but it was always the unexpected that happened, and they found now that their Engineers—like most other engineers and experts—had not been able to calculate exactly the depth to which they would require to go. Therefore their capital expense had naturally increased enormously. They had already expended something like £280,000, and he thought the outlay would amount to £300,000 before the work was finished. But notwithstanding this expense, they believed that they would have good value for their money, and it would be one of the cheapest reservoirs ever built. The work had been carried out in a magnificent manner; but unfortunately when they applied for some relief for the present generation, they found they could get no help. In consequence of having commenced interest and repayment of capital as soon as the first sod was cut, the rate-in-aid had gone up from 1d. to almost 9d. in the pound. The town at the present moment was pretty heavily rated—about 8s. Well, they induced their representatives to have an interview with Mr. John Burns, who gave them a very sympathetic hearing; and at his request they sent on full particulars of the state of affairs. However, after some little time they received from him a communication simply referring back to the Act with respect to loans. They did not feel satisfied with this, and made a further application, which was still under consideration. In the meantime, the Council of the Association of Municipal Corporations had been instructed to ask for a deputation to the right honourable gentleman and the Local Government Board to bring this question before them. In June the Council asked for a deputation; and they applied again in November. But they received exactly the same reply; they were referred to the Act of Parliament. He did not know whether they were going to sit down under that or not. If the Association were going to be of any real use to the municipalities, then it was time that some energetic means were taken in order that the towns might be relieved. The present generation should be relieved of the great burden which was placed upon them to-day. If towns were to be discouraged from performing their duties, the Local Government Board were adopting the right course to do so. What Halifax desired was that the Council of the Association should take most energetic means to bring before the Board the absolute necessity for some relief being granted in this matter, so that they could get an extension of time for the repayment of loans for permanent works of this character.

The President remarked that they had been endeavouring to obtain a deputation, and had left no stone unturned to this end during the last six months.

The Mayor of Rawtenstall expressed the opinion that land purchased for gathering grounds should have at least a hundred years for repayment of loans. It should be spread over three generations.

The motion was agreed to.

### Payment of Wages out of Borrowed Money.

Alderman G. H. Smith, of Halifax, called attention to the circular issued by the Local Government Board to the clerks to county councils, town clerks, and clerks to district councils with reference to the payment out of borrowed money of wages of permanent workmen, dated Feb. 4 last; and moved "That the question be referred to the Law Committee for the purpose of securing a modification of the terms of the circular, so far as it affects the wages of ordinary workmen." He said the action the Local Government Board had recently taken in this matter was a new departure; and if the same line was to be adhered to, corporations would not be able to carry out any constructional works themselves. The question had been before the Municipal Electrical Association. The only reason, one was led to believe, why the Board had adopted this course was that some bodies might have charged to capital account sums which should have been charged to revenue.

The Town Clerk of Derby pointed out that the President of the Local Government Board had been approached time after time without success.

The Town Clerk of Eastbourne said the question had been before the Law Committee; and the Town Clerk of Wimbledon and himself had drafted a report asking the Local Government Board to receive a deputation from the whole Association, so as to give expression to the very strong views they entertained in this matter.

On this understanding, the subject was allowed to drop; and the meeting went on to consider other questions—ranging from the supply of milk to the Territorial and Reserve Forces Bill. One resolution which met with very small favour was to the effect that local authorities, if they thought fit, should be empowered to make a bye-law requiring every new "domestic building" to be provided with a "bath of adequate capacity, with a good supply of water laid on." It appeared to be the general opinion that such a bye-law might prove somewhat of a hardship to builders; it being remarked by one member present that, to be of any real use, the proposal should be followed by another making it compulsory on all persons to have a bath so many times a week.

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**Morecambe Municipal Gas-Works.**—At the meeting of the Morecambe Town Council on Monday last week, Alderman Snowden announced that the Gas Committee had reported that the gas undertaking would, for the first time, this year pay its way, and next year it was expected that it would contribute something to the relief of the rates. The works were transferred to the Corporation by agreement in 1900.

## JUBILEE OF THE HOBART GAS COMPANY.

The Hobart (Tasmania) Gas Company celebrated their Jubilee on Saturday, the 9th ult., by giving a dinner to the employees, in the Masonic Hall, under the presidency of Mr. JOHN HAMILTON, the Chairman of the Directors. Among those present, including members of the Board, were the Company's Consulting Engineer (Mr. Philip Holmes Hunt, the Chief Engineer of the Melbourne Gas Company), the Chiefs of the Carbonizing and Distributing Departments (Messrs. D. C. Tanner and G. H. Burton), the Secretary (Mr. W. J. Campbell), the Electrical Engineer (Mr. H. J. Spencer), and the Solicitor (Mr. Russell Young). The entire company numbered more than 70; but some of the employees could not leave their duties.

The CHAIRMAN, in proposing "The Day we Celebrate," asked those present to carry their minds back 52 to 54 years. He said in those days the lighting was very primitive in Hobart—that of the streets being mainly supplied by the dim lights which the publicans were compelled by law to hang over their front doors. In addition, there were a few lights at the corners of the principal streets. Indoors the lighting was restricted to tallow, composite, or wax candles, and a few oil-lamps. In such circumstances, he remembered how the introduction of gas was considered a great innovation. The black whale oil burnt in lamps gave out disagreeable fumes, and the need of gas was very great. So some of the more public-spirited men of the place came together, and decided that the time had arrived to form a Gas Company. They held their first meeting on June 5, 1854, at an inn which had just been pulled down—there being no public hall at the time; and the Company was at once formed. On the 2nd of August following, the Directors were elected; and in November a site for works was purchased for £6000, and the necessary plant was ordered from Scotland. This arrived in December of the next year, and with it workmen and a Manager—the latter being Mr. W. R. Falconer. A month later tenders were received for erecting the works, in which no one took a deeper interest than the late Mr. George Whitcombe, who was a Director and the first Secretary of the Company. On March 9, 1857, the city was lighted with gas for the first time. They now had 50 miles of mains, while in a city of the same population more closely populated it would be only perhaps from 10 to 12 miles. This made a great difference in relation to cost of production and labour. Moreover, much hard rock had had to be cut through in laying the pipes. The Chairman concluded by referring in complimentary terms to the good service rendered by the pioneers of the undertaking; and he assured the company that the foundation so "well and truly laid" by their predecessors the present directorate were striving to maintain. They were adopting an enterprising policy, studying the consumers, and moving with the times; and they were well supported by a very loyal and capable staff.

The toast was enthusiastically honoured.

Mr. RUSSELL YOUNG proposed "The Officers of the Company," coupling with the toast the names of Messrs. Campbell, Hunt, Burton, and Tanner. He said Mr. Campbell had been Secretary for 25 years, and was in the Company's service two years before taking the position. He (Mr. Young) had been associated with the Company for upwards of 40 years; and he knew how much the Directors and all concerned appreciated Mr. Campbell's services. As to Mr. Hunt, they considered themselves fortunate in having so eminent a Consulting Engineer. Mr. Tanner's services were able and faithful. As to Mr. Burton, who had been in the service over 20 years, they all knew and esteemed him.

The toast was received with musical honours and hearty cheers by the large body of men present.

Mr. CAMPBELL, in responding, referred to the great strides the Company had made. He said they had 82 gas-meters in use when they started, and a year afterwards 1700; while they now had 4386 fixed. In 1882, they made 23 million cubic feet of gas; whereas in 1906 they made 84 millions. He claimed that the Company had throughout been very progressive, and had displayed their enterprise and desire to meet public requirements by putting their money into electric lighting as well as gas. Thereby the public were able to obtain either light. He believed they were the first Company in Australia to adopt penny-in-the-slot meters, of which they had 450 in daily use, fulfilling purposes for which the other meters were not suitable. They were also the first Australian Company that he knew of to fix cookers free of charge. He thought he expressed the feelings of all in thanking the Directors for this opportunity of meeting together.

Mr. HUNT, in acknowledging the toast, referred to the marvellous progress the gas industry has made since its introduction, and pointed out that the capital invested in gas companies in Great Britain, apart from municipally-owned works, had increased by £42,000,000 in the last twenty years. Such figures, he said, indicated that the industry was on a very sound footing, full of vitality, and making great progress. One of the features of the progress of recent years was the fact that gas companies had realized that they had something more to do than to get dividends for their shareholders; they recognized that they had to consider their consumers and the public generally. He hoped the Hobart public were appreciating the service they were getting from their Gas Company in the lighting of the public streets. From what he had been able to see, he did not think they would find a better service in any city in the Commonwealth. As to their plant, he would say that when the installation at present being carried out was completed, they would not find better carbonizing plant in the Southern Hemisphere; and he might point out that practically the whole of the work was being done by the Company's own staff. Mr. Hunt concluded by referring to the co-partnership system of the South Metropolitan Gas Company. He said he considered such co-operation highly desirable; but he pointed out that underlying any scheme of the kind there must be a desire on the part of employees to do their work efficiently, and push the business of the Company, and a willingness on the part of the Directors to recognize the work of the men.

Mr. SPENCER proposed "The Board of Directors," to which Sir ELLIOTT LEWIS responded.

The toast list was concluded with three cheers for gas lighting and electricity. The Directors then withdrew, leaving the employees to spend the rest of the evening in social enjoyment together.

## QUALITY OF SOUTH LONDON GAS.

### The Sulphur Question.

The weekly returns made by Dr. Frank Clowes, F.I.C., to the London County Council, on the quality of gas supplied in the Administrative County of London during a recent period of twelve weeks, have received consideration from the Camberwell Borough Council. The returns were referred to Alderman Hearson, who has reported on the matter to the Public Health Committee.

Dealing first with illuminating power and pressure, Alderman Hearson expresses his pleasure that the results of the testings are slightly in excess of the amounts prescribed; and he says the extra illuminating power is so obviously in favour of the consumer that it needs no comment. The greater pressure is also to the purchaser's advantage, provided ordinary care is taken not to turn on more than is necessary to produce the result desired. Alderman Hearson considers the information given for the first time as to the calorific power of the gas supplied is of too much importance to be passed over without special comment; and he suggests that all users of gas will do well to make themselves fully acquainted with the import of the figures now placed before them. The Government have not yet fixed on a definite standard of calorific power; but he says the returns given will enable users of power and others to form a correct estimate of the duty they may expect from a known quantity of gas consumed in gas and other heat engines. The Committee are informed that "the calorific power of the gas now supplied in South London is not, of course, equal to that of the 16-candle gas formerly supplied by the South Metropolitan Gas Company;" and that consequently a larger quantity has to be burnt to produce the result previously obtainable from a given quantity. But when the difference in price is taken into consideration, it is acknowledged that "the advantage is slightly in favour of the cheaper gas of lower heating power;" so that, on the whole, there is nothing to complain of from the point of view of those who use incandescent burners, whatever may be urged against the gas by people who still persist in employing those giving a flat flame.

Passing on to the subject of sulphur impurity, Alderman Hearson expresses regret that the hopes held out by the gas managers before the Departmental Committee appointed by the Board of Trade to inquire (among other things) into the effects likely to arise in case the Government decided to allow the gas companies to dispense with wet lime purification, have not been fulfilled, and that, in his opinion, this matter will require further legislation. He calls the attention of the Committee to the fact that the returns show that the quantity of sulphur has risen from the 22 grains per 100 cubic feet formerly allowed in winter, to an average of 50 grains; while in one case it actually reached 84 grains. In pointing this out, Alderman Hearson says it is not his desire to "harass the gas companies unnecessarily." He says: "They pleaded for, and were given, a free hand by the Legislature, to enable them to show us what they could do. The present is the first report of a new series, and we ought to show the company that we are alive to what is going on, so that they may not settle down with the idea that nothing better could be desired. My object is to stimulate them to further experiment, until the present enormous dose of sulphur shall approximate more nearly to the proportion which prevailed before the present privileges were conceded; for I cannot bring myself to believe that the resources of chemistry have yet been exhausted with no better result than the report on the table." Alderman Hearson adds that in every case in the returns the gas under examination is marked free from sulphuretted hydrogen; and he says that when the amount of sulphur from other sources can be reduced to the amount now indicated by the sulphuretted hydrogen test, gas managers and the public will have equal cause for congratulation. Till then, with or without penalties, the sulphur problem must not, he urged, be lost sight of by those who have the duty of looking after the public interest.

Accompanying the report was a table, compiled on the lines of the returns issued weekly by the London Council, giving the figures showing the average illuminating power and the calorific power of the gas, and the local averages of sulphur per 100 cubic feet contained in it, for a period of twelve weeks. The following are the averages over the whole area covered by the returns:—

| | | Gaslight and Coke Company. | | South Metropolitan Gas Company. | | Commercial Gas Company. |
|---|---|---|---|---|---|---|
| Argand burner . . | (candles) | 16·61 | .. | 16·84 | .. | 15·45 |
| Flat-flame burner . | ,, | 11·88 | .. | 11·14 | .. | 9·45 |
| Calorific power . . | (calories) | 132·50 | .. | 134·20 | .. | 127·80 |
| Sulphur . . . . | (grains) | 39·90 | .. | 46·50 | .. | 35·10 |

A copy of the report is to be forwarded to the London County Council, with a request for their observations upon the subject.

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**New Water-Works at Basingstoke.**—New water-works for the borough of Basingstoke have just been completed at a cost of nearly £20,000. The scheme was designed by, and executed under the supervision of, Mr. F. R. Phipps, the Borough Engineer and Surveyor.

**Gas and Electric Lighting at Port Elizabeth.**—The ratepayers of Port Elizabeth were recently called together to sanction the borrowing by the Corporation of £25,000 to complete the electric lighting scheme. In the course of the proceedings, some instructive facts came out. The original estimate for the scheme was £83,358; but a sum of £110,467 has been expended upon it—an excess of £27,109. One item in the estimates was £750 for mains and services; but the expenditure on these has been £4275. It was explained that this additional outlay was forced upon the Corporation by the severe competition of the South African Lighting Association. The fact was that the Association had introduced free fitting; and the Corporation had to follow on the same lines. One ratepayer protested against granting the additional money; but he only created amusement, and the required amount was sanctioned by an overwhelming majority. The undertaking has been anything but promising up to now; but the ratepayers appear to believe in its ultimate success.

## RIVER PLATE GAS COMPANY, LIMITED.

### Increased Prosperity and Dividend—A Decade's Progress—A Strike and Labour-Saving Appliances.

The Annual General Meeting of this Company was held last Friday, at River Plate House, Finsbury Circus, E.C.—Mr. A. E. BOWEN in the chair.

The SECRETARY (Mr. H. T. Adkins) read the notice calling the meeting; and the Directors' report and the accounts were taken as read.

The CHAIRMAN, in moving the adoption of the report and accounts, said the Directors had to record the death of another of the pioneers of their business, Mr. Alfred T. Hooper, who was a Director of the old Belgrano Company for 25 years, and who was with them from the start of this Company. The Directors greatly missed him, though for some time he was not able to attend much to the Company's business. The Board had induced Mr. J. Murray Tulloch to take his place; and Mr. Tulloch's long experience in Argentine affairs was of the greatest assistance to them. This was the tenth annual meeting of the Company; and it had been his good fortune to have been allowed to occupy the chair all the time, and to have been able to give the shareholders each year an almost uninterrupted report of progress and prosperity. The Board were very pleased to have again a record report to present. In the preceding year (which was the best they had experienced up to then), the profits were £120,934; whereas, this year they were able to deal with £135,114—an increase of more than £14,000, which the shareholders would no doubt consider was very satisfactory. It had occurred to him that this being the tenth year of working, it might be interesting to look back and see the progress made since the amalgamation, which was the *raison d'être* of the Company. In 1897, the share capital was £848,070; now it was a round million. The debenture stock issued was £250,000; now it was £312,650—an increase of £62,650. The reserve fund was started in 1898; and if the Board's recommendation was passed that day, it would be £165,000. The amount expended on capital account during the ten years was £265,094. In 1897, the mileage of mains was 317; now it was 430½, or an increase of 113¼ miles. They had obtained on balance 15,594 new consumers in the ten years; the figures being 21,000 in 1897, and 36,594 in 1906. During the same period, the municipal lamps had increased by 1966—from 5700 to 7666. They had in the ten years spent on the upkeep of the works and mains out of revenue no less than £182,691. The taxes paid in 1897 amounted to £16,636; whereas in 1906 they paid no less than £30,819 under this heading. Finally, the Directors had paid the shareholders during the whole period up to 1905, a dividend of 7 per cent. per annum free of tax, and were this tenth year able to recommend an increase to 8 per cent., also free of tax. He thought the shareholders would agree with him that all this was a record of solid prosperity; and he saw no reason whatever to fear that this condition of prosperity would not continue. The city of Buenos Ayres was still rapidly expanding. In 1905, the Company obtained 2181 new customers; while in 1906 they put in no less than 2987 new services. They had added 11½ miles to their network of mains; making a total, as he said before, of 430¾ miles. During the year the sales of gas increased by no less than 8·70 per cent. over 1905; and this on top of an increase of the latter year of 5·80 per cent. over 1904 and 6¾ per cent. in 1904 over 1903. This increase had been fully maintained during the first two months of 1907. Their business in cookers, heating apparatus, and incandescent burners continued to expand very rapidly—indeed, it was only limited apparently by the amount of skilled labour they could obtain. This labour was very scarce in Buenos Ayres; and they were quite unable, in consequence, to cope with the demands made upon them for cookers, &c. However, they had now an expert out in Buenos Ayres looking carefully into the whole question of these accessories; and no doubt the various problems before the Board would be successfully solved. From the figures he had given, the shareholders would easily gather that they were not suffering at all from the competition of the Electricity Company, who were also doing a very fine business. He was very glad to be able to again assure the shareholders that the Company's relations with the Municipality and the other Authorities continued to be very cordial. The new Lord Mayor (Mr. Alvear) facilitated their operations in every possible way. The accounts for the public lighting were paid promptly. Indeed, the December account was paid up on Jan. 15; so that there was nothing whatever to wish for in this respect. The labour troubles in Buenos Ayres had again been acute, and all trades had been affected more or less. The Company's men did not bother them as much as usual during the year under review; but in February last the professional agitators succeeded in inducing the men to form a Resistance Society, and to formulate demands for utterly impossible conditions, which would, if conceded, have cost the Company £12,000 to £15,000 a year. This was at once known by their General Manager and the Chief Engineer, who saw that very energetic measures were needed to quell the storm. They and Mr. Woodgate hurriedly made arrangements, and then summarily dismissed several of the ringleaders. The other men, as they foresaw, at once struck and left the works. But the officials had a considerable number of free men safely stowed away; and within an hour they were at the works. The National Government also, in compliance with a promise to the Company, sent 60 or 70 stokers from the Navy, and work went on very much as usual. After three days, the men gave way, and petitioned to be taken back on the old terms; but only the best of them were allowed to do so. The Directors thought and hoped that this very severe lesson had been taken to heart by the men, and that the Company would be free from these troubles for some years. The Company were very much indebted to their Local Committee, to their General Manager, and Chief Engineer for the admirable manner in which they met this crisis. There was no excitement, no flurry. But the swift and energetic action taken by their friends saved their customers and the public lighting service from any inconvenience whatever. Of course, they had caused the thanks of the Company to be conveyed to the Minister for the invaluable help given by the naval contingent.

It would be seen by the report that during the year they had spent £14,112 out of revenue for upkeep of the works and mains, &c., This was £5500 less than in 1905, which was an exceptionally heavy year; but, of course, everything was up to the high standard they had always maintained. Coal cost 4s. 3d. per ton more in 1906 than in 1905; and oil 2s. 1d. per ton more. First costs and freights were both higher; the total extra cost being over £10,000. The revenue account showed a profit of £128,053, against £116,295—an increase of nearly £12,000. Exchange profit was £600 better, at £3056; interest on investments was £3947, against £2107. The reserve fund was £145,000, against £121,500; and if the Directors' recommendation was accepted that day, it would be £165,000. The capital expenditure for the year totalled to £37,894, which was over £20,000 more than was spent under this head in 1905. In view of the perennial labour troubles in Buenos Ayres, the Directors decided to provide the different works with the very latest and most up-to-date labour-saving appliances; and so there was installed at Corrales an electric retort-charging apparatus, which cost, with the electric generator and everything complete, some £3000. Then they put up, at a cost of some £8000, electric machinery for discharging the coal from carts and tramway waggons, and for storing it in the works. The water-gas plant in Corrales was extended to almost double its former capacity, at a cost of £3700; and a new water-gas plant was put up at Belgrano, costing also £3700. All this new plant had been a great success; and it was most instrumental in enabling the Company to fight and beat the strikers last February. New mains (11½ miles) had cost £6400; and the new services (2987), £11,500. He now came to perhaps the only unsatisfactory item in the business. Some years ago many shareholders urged the Directors to invest the reserve fund in gilt-edged securities. It was until then in the business, and earning at least 7 per cent. Well, it seemed to the Board that the request was not altogether unreasonable, so they called up the additonal capital, £148,930, squared off the capital account, and invested the reserve fund in Consols, trustee stocks, and railway debentures, with the result that at the end of 1905 they had to write off against revenue for depreciation £1600. Last year, 1906, they received £3900 for interest, and had to write off £4493 for depreciation, which did not seem to be very good business. Personally, he had never been able to bring himself to invest in these speculative things; he preferred gas. As to the appropriation of the balance at the credit of profit and loss account, it was proposed to add to the reserve fund £20,000; and the Directors wanted the shareholders to allow them to start a plant-renewal fund with £5000, although, as he had told them every year, they had fully maintained everything out of revenue, and had spent no less than £182,000 under this heading during the last ten years. The Board felt that possibly some of the plant might be getting obsolete, new appliances might be invented which would render some of their machinery useless or too costly to continue; and, therefore, they desired to be prudent, and be prepared for whatever might happen. They also wished to give £2000 to the old age and pension fund. Then they proposed to pay a final dividend of 10s. per share (tax free), making 8 per cent. for the year, and to carry forward £25,246, against £21,222 brought in. He had every reason to think that the Company would be able to maintain this rate of distribution. He would ask Mr. Ogilvie, who was out in Buenos Ayres at the beginning of last year, to second the resolution.

Mr. C. P. OGILVIE, in seconding the motion, gave an account of his impressions during his visit to Buenos Ayres. Nothing, he remarked gave him greater pleasure than to see how thoroughly capable every man was in the Company's service. Those who were in charge out there had really given their whole souls and work to seeing the thing succeed; and it was due to them, as much as to the London Board, that the latter were in a position to give the shareholders 8 per cent. The works had been thoroughly kept up. Regarding the distribution system, he remembered that in opening up streets some time ago they found that gas-pipes had absolutely disappeared; there was nothing left but a clay channel for the gas to pass through. This was due to the various salts in the ground. They had got over this trouble by wrapping up the pipes in other material, so that the salts did not affect them.

A few inquiries for information, mostly concerning the accounts, were put; and the Chairman replied to them. Among general points was one as to the Buenos Ayres (New) Gas Company. The Chairman remarked upon this that the Companies were competitors, but very good friends. He saw in the papers that they were keeping to their old dividend of 7 per cent., and so had not seen their way to go up with the River Plate Company.

The resolution was unanimously carried.

The dividend recommended having been declared, the retiring Directors (Mr. Charles J. Hegan and Mr. Alfred le Rossignol) and the Auditors (Messrs. Welton, Jones, and Co.) were re-elected.

The customary votes of thanks concluded the proceedings.

## ANOTHER ACCOUNTANT ON DEPRECIATION.

In the "JOURNAL" last week we noticed at some length a lecture by Professor Lawrence Dicksee, M.Com. F.C.A., on the subject of "Depreciation." We have since received a print of a paper dealing with the same question, read before the Institute of Directors by Mr. P. D. LEAKE, F.C.A., F.I.D.,* from which we make a few extracts.

Mr. Leake begins by explaining the word "depreciation" as "expired outlay on productive plant;" and he points out that no profit can exist until this has been provided out of gross revenue—a matter which he says does not seem to be altogether appreciated. He defines productive plant as "all perishable material property owned by an undertaking other than that primarily intended for resale." Most of the capital of gas and water companies is consequently invested in productive plant;

* This paper was referred to in Mr. Sibson's letter on the "Replacement of Exhausted and Obsolescent Plant," as published in the last number of the "JOURNAL."—ED. J.G.L.

and it has ultimately to come back out of the gross revenue. About this, there is no room for doubt. Where difference of opinion arises is as to when it is to come back. The extreme efficient economic life-period of any class of productive plant scarcely ever exceeds a hundred years, and rarely exceeds fifty. It is most commonly between ten and thirty years. Mr. Leake considers that money invested in productive plant, being nothing more than a payment made in advance on revenue account, may be compared to a premium paid in advance to cover (say) seven years' fire insurance. Such a payment is, in fact, sometimes made in order to secure better terms than would be obtained by paying an annual premium; and there is, in such case, no doubt that one-seventh of the sum paid would be charged to revenue account each year, until, at the end of the seventh year, the last instalment of the original payment would have come back out of gross revenue. Therefore, if the directors of an undertaking lay out (say) £6000 of capital in the purchase of a certain kind of productive plant which the competent and responsible officers declare, after taking into account the ravages of use and time and the probabilities of obsolescence, is likely to have an efficient economic life of ten years, should not one-tenth of £6000 be taken out of the gross revenue every year as a proper charge for the use of the plant? Mr. Leake thinks that it should. He cannot follow the argument that because the plant has been well maintained and is working more smoothly at the end than it did at the beginning of the first year of its life, no part of the original cost need come back out of the gross revenue of the first year. If the productive plant purchased with the £6000 had been completely used up and exhausted in the business of the undertaking exactly within an account-period of one year, no one would suggest that the profit on the year's working could be ascertained until the £6000 had come back out of revenue. The fact that the outlay incurred on revenue account does not all expire within an exact account-period of one year is therefore no reason for neglecting to refund out of the gross revenue the year's expired portion of the outlay. In Mr. Leake's opinion, depreciation is an operative expense as much as operative wages.

After referring shortly to some of the methods at present in most general use for ascertaining and providing for depreciation—comprising the "percentage off reducing balance," the "annuity," and the "sinking fund" methods—Mr. Leake compares the two latter, and condemns them both as being unsuitable for common use in measuring expired outlay on productive plant. Methods involving interest or discount are, in his opinion, equally unsuitable. He emphasizes the importance of having a classified record of the capital outlay on productive plant, and then notices some of the factors to be taken into account in estimating the efficient economic life of each class of productive plant. These are: Use, time, and the likelihood of supersession by improved inventions and appliances of a similar nature. Careful regard must, he says, be had to the question of residual value, which would occasionally be very considerable. The most important factor is time, because, whether productive plant be used much or little, it is apt to decrease in value year by year; and sometimes this decrease is even more marked when it is not used, or is only partially used, than when it is fully employed. The question of probable supersession owing to improvements—sometimes called "obsolescence"—is much more difficult to determine, and applies more to some industries, especially new ones, than to others. Thus, in the case of electrical undertakings it would be a most serious item, and should be substantially provided for in estimating the length of life of the productive plant engaged in it; whereas in other undertakings—as, for instance, waterworks—there seems to be no great danger to be apprehended from this particular cause.

Mr. Leake suggests that every joint-stock or municipal trading undertaking should be required by statute to keep a register of plant, in which the year of purchase and the cost of each of the various classes of productive plant in which capital is invested should be recorded under proper heads. Such a register would, he thinks, be a most valuable check upon doubtful financial methods, where they exist. The register should be open to the inspection of *bonâ-fide* shareholders holding shares of the nominal value of £100 and over, whose names had been on the books for three months and upwards; and in the case of municipal concerns, it should also be open to any ratepayer. Mr. Leake describes a convenient form for such a register. It consists of a loose-leaf book of suitable size, having pages allotted to each class of productive plant, every page ruled with twelve separate cash columns, one for each year, and headed with a description of the productive plant, and the declared length of life in years, and having a space for the signatures of the officials responsible for declaring that length of life. In making up the financial accounts at the end of each year, the original or renewal outlay during the year on each class of productive plant as shown by the ordinary financial ledgers is transferred in total to the appropriate page and column for the particular year in the register. A half-year's depreciation is then deducted therefrom, which, added to the one year's depreciation deducted from each of the still unexpired amounts appearing in the previous columns, enables the total provision for depreciation on that particular class of plant for the year to be ascertained and transferred to a summary sheet. Then the totals of (*a*) capital outlay, (*b*) depreciation, and (*c*) balance, increasing or decreasing the unexpired capital outlay for each class of productive plant, will be ultimately abstracted from each of the current class summary sheets to a general summary for the year; the depreciation column of this general summary showing the amount necessary to be charged to the revenue account for the year before any profit can result. Many years' history of hundreds of different classes of productive plant can be recorded in a register of this kind (sample pages of which are given in the Appendix to the paper) without confusion.

The author next points out that it is depreciation, not cost, that is chargeable to the revenue account; but that repairs and partial renewals are so chargeable. The difficulty, of course, is to distinguish the renewals which must not be borne by the year's revenue and those which should come out of it; and Mr. Leake thinks this question can be best settled by means of standard schedules prepared with the co-operation of the engineer's and accountant's departments. He says it may be objected that the charging to revenue account of an equal instalment of the original cost of plant each year, as well as of the cost of repairs and partial renewals as paid, will unduly burden the revenue accounts of the later years of the productive life of the plant. But he points out that against this there is to be set the fact that money originally locked up in the purchase of this productive plant is being gradually released, and will find profitable employment either in the undertaking or by investment in outside securities; and the income resulting will come to the revenue account. Again, in a large undertaking, the annual expenditure on repairs and partial renewals averages itself in a remarkable way. He is not sure, however, that it would not be an advantage that the burden of extensive repairs necessary when a particular class of plant is becoming decrepit or obsolete, should tend to fall heavily on revenue at that time—thus forcibly calling attention to the need of replacing this by modern and up-to-date plant.

Coming to the subject of municipal trading and depreciation, Mr. Leake takes the case of an electric tramway undertaking managed by a company and by a municipality respectively, and examines the difference involved in the method of dealing with the profits. The capital consists of £120,000 in shares and £5000 on loan; and the credit balance on twelve months' working, after charging the cost of repairs and partial renewals, is £19,882. Allowing £12,682 for depreciation, or "expired outlay on productive plant," the balance of profit is £7200. In the case of a company, this would allow of a dividend of 5 per cent. being paid on the share capital, and of £1200 being either carried forward or placed to the credit of a general reserve account against any possible diminution of profits in subsequent years. If the undertaking were in the hands of a municipality, and the money had been raised by a loan at 3 per cent., repayable in thirty years, then, in order to provide for the repayment of the loan out of profits at the end of that time, it would have been necessary to deal with the annual profits thus: Sinking fund provision for repayment of loan, assuming an investment at 3½ per cent. compounded yearly, £2325; interest on loan, at 3 per cent., £3600; balance of profit, available for the relief of the rates, £1275—total, £7200.

Mr. Leake next deals with the controversy as to whether the annual sinking fund provision for the repayment of the loan is payable out of true profits (that is, after providing for depreciation) or out of the balance of revenue account before making this provision. Under the difficult circumstances, the view of the Local Government Board is believed to be that the repayment period should be fixed well within the economic life of the productive plant—that is to say, should involve the annual setting aside of a sum rather more than sufficient to renew the plant at the end of its economic life. This is apparently, in the present state of the law, the utmost limit to which they can extend their control. By this means the Board are endeavouring to ensure that the annual sinking fund instalments shall at least provide a sum sufficient to repay the loans by the end of the economic life of the productive plant, for, under the present state of the law, there is no guarantee whatever that municipalities will set aside out of gross revenue a sufficient, or any, sum to meet that part of the operating expense which consists of depreciation or expired outlay; and the Board have been striving to shorten the loan periods with this object, at the same time having to acquiesce in the view that a setting aside to repay the loan on this basis sufficiently complies with the law.

The author considers it undesirable that a Government Department should be compelled, or indeed permitted, to take the responsibility of endeavouring to fix the length of the economic life of these numberless different classes of productive plant, upon which so many millions sterling are expended. This responsibility ought, he thinks, to be assumed by means of statutory declarations by qualified engineer officers of the municipality, who, with the people's elected representatives, will be responsible to the ratepayers; or if there is no qualified engineer employed by a particular municipality, then the declarations should be made by some professional engineer of repute. The Local Government Board would then be in possession of some data on which to fix the amount of the annual sinking fund instalments, if it was desired that these should mature before the end of the economic life of the productive plant, so that they may equal the necessary provision for depreciation.

Notwithstanding the efforts of the Local Government Board, Mr. Leake thinks it is admitted that the repayment period of loans is in many cases much longer than the economic life of the productive plant for which the money was borrowed; and in these cases he urges that municipal authorities should charge their revenue account with a sufficient provision for depreciation to pay for ultimate renewals, keeping the record of this in the books quite distinct from the sinking fund transactions, the money required annually for which could then always be taken out of the larger sums so retained out of gross revenue to meet the cost of the renewal of plant. The result of such action would, in his opinion, be that, at the termination of the life of the productive plant, a sufficient sum would have been taken out of gross revenue to replace the plant; but a portion would have been invested in outside securities to meet the smaller sinking fund requirements against the ultimate payment off of the original loan. It would then probably be necessary, in order to renew the productive plant, to go to the Local Government Board or some other authority to obtain leave to use the sum so invested in outside securities, and add it to the balance of the amounts set aside for depreciation, which balance would exist in the form of cash in hand or liquid investments. This would mean a new arrangement of the old loan with a readjustment of the period for repayment; but it would not mean the borrowing of any further money, as would have been the case if the revenue account had only been debited each year with the amount of the sinking fund instalment, and the whole of the remaining balance disposed of as net profit.

In the remarks just reproduced, the author has shown how the Local Government Board are endeavouring to make the best of a very difficult position. But it seems to him that, even if they gradually succeed in attaining nearer to their object of fixing the date of repayment of loans well within the period of the efficient economic life of the plant, we are still far from being on sound and businesslike lines. He says a municipal trading enterprise should be able, out of its true profits, to provide the low interest at which municipalities are, or were, able to borrow, as well as the sum necessary to effect repayment of the loan if the period is anything like thirty years; for these two charges together actually amount to less than is required to pay interest at the rate of 5 per cent., which is the lowest rate ordinary well-managed trading concerns would have to pay.

The author does not consider there is anything unreasonable in supposing that the intention of the Legislature was that, in the case of municipal trading concerns, the sinking fund contributions should be set aside out of profits; and in such a case there would be at the end of the thirty years—supposing the undertaking already mentioned had been maintained, and was of exactly the same extent at that time—a sum of £120,000 accumulated in outside securities (out of annual interest saved through exceptionally favourable borrowing facilities) available to pay off the whole of the loan, and in addition, of course, there would be the still existing tramway and equipment remaining, of the value of £120,000. He recognizes that it is this contention that has caused a good deal of indignation among some people, though he says it merely means that the municipality would be the owners, free of debt, of a valuable undertaking or property, just as if a public park had been the subject-matter of the purchase instead of an electric tramway undertaking. In either case the gradually acquired possession by the municipal authority of so valuable an asset would be a factor constantly tending to increase the value of property in the district as the period of final repayment approached; so that, in the author's opinion, it is scarcely a question of burdening one generation for the benefit of another.

Reverting to the subject of the proposed register of plant, Mr. Leake says he does not suggest that any liability should attach to directors or others in connection with it, except that a company or municipal body making default in keeping the statutory records would be subject to a sufficient penalty during the continuance of the default. He remarks that the assessment, with substantial accuracy, of the annual net profit or loss is now a matter of vast public importance; and all the necessary factors to which regard must be had, except this one of provision for depreciation, have received careful attention. The factor of depreciation constitutes a very large part of the operative expense of most industrial undertakings; and the hopeless state of chaos into which it has drifted constitutes a grave public danger, which is even assuming the dimensions of a national danger in these days of municipal enterprises. The proposed register is suggested as being in the nature of a much-needed guide and source of information, and not as a cramp or check to freedom of action. By its adoption, more information than at present would be available for both directors and shareholders; and this is what the author is anxious to secure. Such a register, if made obligatory on all new joint-stock and municipal industrial undertakings, would not, he thinks, be objectionable to the great body of able and honest directors, who might even welcome it as a help to them; and it would certainly be of assistance to those who are now unaware of the importance of this matter. In the case of existing undertakings, however, its use might be left as a voluntary question.

## NEW WATER-WORKS FOR OTLEY.

On Saturday, the 13th inst., the new water-works which have been under construction for the past three years for the supply of Otley were formally opened by Mrs. T. A. Duncan, the wife of a gentleman who has been for about thirty years a member of the Urban District Council, is Chairman of the Water Committee, and has taken the most prominent part in carrying out the scheme, which has cost nearly £100,000.

Otley's first water supply was drawn from East Chevin; and the undertaking was followed, first by the building of a tank on West Chevin, and then by getting supplies from Menston and Ellar Ghyll. Later, there were borings at Burley. But these various sources proved inadequate to the needs of the town, especially in summer; and eventually the District Council took determined action in the matter. Failing to get parliamentary sanction to impound Bow Beck at a cost of £75,000, they turned their attention to March Ghyll, Middleton, where, under the engineering guidance of Mr. John Waugh, of Bradford, they have carried out a scheme. Its history resembles that of many similar undertakings in the country; for whereas the original estimate was £55,000, the expenditure will be £95,000. Presumably, the difference partly arises from unforeseen difficulties. The final results, however, are highly satisfactory; and both Mr. Waugh and Messrs. H. Arnold and Son, of Doncaster, the Contractors for the reservoir, were complimented at the opening ceremony.

The gathering-ground and the site of the works cover an area of 1000 acres. The former consists of 970 acres of uncultivated moorland, stretching up to Beamsley Beacon on the north-west, without a building of any kind on it, and is therefore well suited to its future purposes. The site of the reservoir, embracing 18 acres, was not, perhaps, one of the best; but everything that skill could devise to adapt it has been done. Besides the water from the gathering-ground, the reservoir is fed by three streams—viz., Delves Beck, Middle Ghyll, and Loftshaw Ghyll. The capacity of the reservoir is 100 million gallons, which represents 200 days' supply for Otley. At March Ghyll, the water is impounded by an embankment 550 yards long; and, the reservoir being 700 feet above sea level, there is ample fall.

The inauguration of the new works aroused considerable interest, not only in Otley, but throughout Wharfedale. Before the ceremony, there was a luncheon at which the Chairman of the District Council (Mr. E. Greaves) presided. The toast of "Success to the New Water-Works" having been honoured, the company proceeded to the valve tower, off the reservoir, the doors of which were unlocked by Mr. Greaves. Mrs. Duncan was then invited to turn on the water into the filter-beds; and Mr. John Brown—a veteran member of the first Local Board for Otley, formed in 1864—who was celebrating his 87th birthday, unveiled two commemorative tablets on the west of the buildings. On one plate was inscribed the names of those who were members of the Council at the ceremony of turning the first turf, and on the other the names of the present members. Souvenirs of the occasion were presented by Mr. Waugh and Mr. Arnold to Mr. Greaves and Mrs. Duncan; the former receiving a gold key, and the latter a large silver rose-bowl. A presentation, consisting of a gold key, was also made by Mr. Waugh to Mr. Brown.

## POOLE WATER ARBITRATION.

Arbitration proceedings between the Poole Water-Works Company and the Poole Corporation commenced at the Westminster Palace Hotel on Thursday, the 4th inst., before Mr. RAM, K.C., Umpire; the Arbitrators being Mr. HENRY ROFE, M.Inst.C.E., for the Corporation, and Mr. G. R. STRACHAN, M.Inst.C.E., for the Company.

Mr. BALFOUR BROWNE, K.C., and Mr. W. O. WILLIAMS appeared for the Company; and Mr. HONORATUS LLOYD, K.C., and Mr. VESEY KNOX (instructed by Messrs. Sharpe, Parker, and Co.) represented the Corporation.

Mr. BALFOUR BROWNE, in opening for the Company, mentioned that the arbitration was under section 7 of the Poole Corporation Act, 1906, which was to the effect that the Company should sell, and the Corporation should purchase, the water-works undertaking on such terms and conditions as should be agreed upon by the parties, or, failing that, for such sum as might be awarded by an arbitrator. The Company were incorporated in 1859. Section 2 of the Act defined the limits of supply; and something might turn upon this. It would have been well if the inhabitants of that day had learned the geography of their own district, because some of the places mentioned as outside Poole were within the borough. The only difficulty that arose now was that there was a place in the borough called Hamworthy, which the Company were supplying at the request of the Corporation. An agreement had been arrived at that the accounts of the Company should be adjusted as far as possible between the two accountants. The accounts showed that there had been a steady and gradual increase in the supply. The supply of the Corporation had fluctuated to some extent, probably owing to the experiments with sea water on the streets; but the amount was now up again. The result was that the gross water-rental had risen from over £6000 to more than £8900. Had the Company charged up to the maximum, their revenue, without any additional expenditure, would have been £2800 more; but he would not say that the Umpire should add this to the net revenue in arriving at a decision. It was quite possible the Corporation might be entitled to make an extra charge; but the Company were a trading concern, and no doubt it would be considered that they had done what was best for both the shareholders and consumers. The water was of great organic purity and softness. Some of the springs contained iron in solution; and on exposure this became oxidized and caused turbidity in the water. Some of the waters, owing to their very purity, acted upon lead. It was found, however, that by treating the waters with chalk, as was done at Sheffield, Bradford, and other places, the turbidity was got rid of, and the action upon lead was absolutely destroyed. The works were in good condition. They had increased as the demands upon them had increased. The population of their district alone in 1881 was 12,156; and it was now 33,000. The growth of the undertaking was shown, first, by the number of the services, and also by the water-rates received, which gave a fair indication of the prosperity of the Company. From 1895 to 1905, the water-rates received had increased by 52 per cent. All the analyses of the water that had been made were eminently satisfactory. The Medical Officer of Health had year by year tested the water supply, and had reported in favour of it. Counsel went on to allude to the parliamentary proceedings in connection with the Act of 1906, and said that, subsequent to the agreement to purchase, the action of the Corporation had not been fair; for they had attempted to blacken the character of the Company as a water purveyor, upon entirely insufficient grounds. They now had a maintainable income of £4604, after deducting interest on the debentures (£600). He had not taken credit for anything except what they had received in 1906; he had not taken credit for their power to charge. It was admitted that the borough of Poole was increasing; and although the Company had no very large surplus, they had certainly water enough to go on with for a considerable time, even without going to the chalk district recommended. The figures showed that there had been a gradual and steady increase in the water-rents receipts, domestic and trade; and under these circumstances they said that these were exceedingly well secured. They had arrears of dividend amounting to £25,000, and had in hand the money to pay the amount with if they chose to raise their prices. Under the circumstances, he thought they were exceedingly moderate in asking that the figure should be multiplied by 30 years' purchase. This came to £138,143. Then there was the rent of cottages and miscellaneous income, which he put at 16¾ years' purchase, making £483. The figure arrived at was £138,626; but there were certain deductions to be made, estimated at £500, leaving £138,126. To this he added 10 per cent. for compulsory purchase, £13,812 odd; giving a total of £151,939. But there were certain matters outside the undertaking, such as an acre of land at Foxholes, which was an asset they asked should be dealt with; and there were other pieces of land which did not contribute to the income of the Company, and must be treated as separate from the figure he had given. A portion of their district was in the area of the Bournemouth Gas and Water Company also. They had not up to the present time supplied this area, although their right was not questioned. When the Corporation were in Parliament, they at first said that they would have the right to supply this area, and they would. But under pressure of the Bournemouth Gas and Water Company this power was struck out. The Poole Water-Works Company had the right to supply, and the Umpire would have to consider what was to be paid for this right. With regard to Hamworthy, they said it was within the town and borough of Poole, and they had supplied there since August, 1876—having been requested to do so by the Poole Corporation. In consequence of this request, they were treated as a statutory Company, having the right to supply.

Mr. *W. B. Keen*, F.I.C.A., said he had had considerable experience in connection with the accounts of water companies, and had been consulted by the Poole Water-Works Company with reference to their accounts, for the purposes of this arbitration. Certain statements of accounts had been agreed upon. Witness went through the various heads of the accounts, and said he had carefully considered the scale of charges authorized to be collected by the Water Company. From inquiries he had made, he had come to the conclusion that the Company had not been charging their full statutory 7½ per cent. on the rack

rent. The increase of revenue the Company could have derived if they had charged their maximum would have been £2800—50 per cent. on the ordinary supplies. He found that the Company had been, and were still, steadily progressing, and that the revenue was more than sufficient for the payment of maximum dividends. By charging with the ordinary growth and bringing the charges up to their standard rights, the Company would have been able to make good their back-dividends, which he found amounted to £24,500. He thought they would have been quite justified in doing this.

In cross-examination by Mr. HONORATUS LLOYD, witness said the books of the Company had not been well kept; but he saw nothing exceptional in the accounts. He had compared the Company's assessments with the poor law assessments. Small houses were included in the 50 per cent. ordinary supplies. As to the charges being high compared with their neighbours, he did not know what the charge was in Bournemouth.

Mr. BALFOUR BROWNE: In comparing this Company and others, all you have done is to compare their charges with what in your view they could charge?

*Witness:* Yes.

Mr. *George Belben*, J.P., the Vice-Chairman of the Company, said he had every reason to expect that the rateable value and the number of buildings would steadily increase in Poole, as it had done recently. Down to 1904, there was no complaint from the Corporation as to the quality of the water. The Directors had adopted several of the suggestions made. From first to last, the Company had been unwilling vendors. They always claimed Hamworthy as within their limits.

Cross-examined by Mr. HONORATUS LLOYD, witness said they had raised no ordinary capital since the agreement. He believed they had sufficient water to meet the demands of their district. He did not admit the necessity of a further supply of water to meet the growing demand. They did not go to Parliament for a Provisional Order because they knew that there was an immediate necessity. He thought the water-charges were higher in Bournemouth than in Poole because the rents were so much higher.

Mr. *E. M. Eaton* gave evidence from personal knowledge of the works of the Company, and the sources and quality of the water supply, and its treatment. He said there was no surface pollution. The waters were extraordinarily pure organically, and very soft.

Witness, further examined on the 5th inst., described the character of the Company's supplies. The sources found their way to filter-beds, and, after filtration, the water passed into the service reservoirs. The water was beautifully clarified in the reservoirs. It was of such good character when it left them that it did not really require filtration at all. They could put the water into the settling tanks if they chose to do so. The machinery was in good condition, and was capable of lifting a much larger quantity of water than was at present required. The machinery and plant had been extended from time to time, and was ample for all purposes. The domestic supplies on the books of the Company from 1901 to 1906 showed a steady and gradual increase. In the latter year, the supply for domestic purposes was 386,823 gallons per day, and for trade 80,166 gallons—the total being 466 989 gallons; or per head per day, 13·2 gallons for domestic, and 2·7 gallons for trade—total, 15·9 gallons. The minimum yield of their system gave them 3 million gallons in excess of what they required to maintain their supply during 1906 (the year for which their claim was made) if they had no storage. But they had 26 million gallons of storage in addition; and there was therefore a considerable margin of security. What came in per day was sufficient to meet what went out; but beyond this there was the storage and the replenishment of reservoirs. In regard to the question of reassessment, the Company could make a permanent increase without any difficulty whatever and with very little expense. In his opinion, 30 years' purchase of the undertaking was a very moderate figure; and it would be reasonable to ask for 16¾ years' purchase of the rent of cottages and miscellaneous income. After deducting £500 for certain expenditure, the figure stood at £138,136 11s. 8d. Adding 10 per cent. for compulsory purchase, his total valuation amounted to £151,939, exclusive of the value of any surplus lands.

In cross-examination by Mr. HONORATUS LLOYD, witness said that in the ordinary sense of the term the filter-beds at Poole, in Lilliput and Waterloo, were really filter-beds; but others were not. They were adequate for the class of water, and for the average quantity that was pumped from their sources. At the time of maximum demand, the water was run through the filter at a quicker rate; but for the usual purposes it was perfectly adequate. The object of the filter was to take out any floating matter or trace of turbidity. They had sufficient reservoirs and also ample pumping machinery to maintain the supply. The pipes, with the exception of two or three of 2 inches and 3 inches diameter, were in a remarkably good state. He regarded the 15·9 gallons per head supplied in 1906 as a fair figure for the district. The minimum yield of all the springs was their average supply of water, not the maximum, which would be taken out of the storage.

Mr. HONORATUS LLOYD: With regard to the 30 years' purchase, do you regard this as a perfect undertaking?

*Witness:* I do not think it a perfect undertaking, otherwise I should not ask less than 33⅓, *plus* 10 per cent.

Where do you get 16⅔ "miscellaneous"?—The "miscellaneous" income is the sale of old stores and such like things, which we always have. It is an ordinary commercial transaction and a business matter. Therefore I take 6 per cent., and cottage rents the same. We capitalize this on a 6 per cent. basis.

In further cross-examination, witness said he always asked for 10 per cent. for compulsory purchase. He had taken into consideration in the Poole case the fair market price for money at the present time.

Mr. HONORATUS LLOYD: What test have you applied?

*Witness:* I applied the test of what a man, having realized his share in this undertaking, would be able to invest his money for in something equally good that would produce him the same income.

And do you think he would have to go away and invest in some similar company?—Yes. But unfortunately he could not. The stock of this Company is not on the market as constantly bought and sold. I am taking something where he could get his income assured.

Mr. BALFOUR BROWNE: With regard to Consols, we used to have a great respect for them.

*Witness:* Yes; but the great infirmity now is the deplorable depreciation in their capital value.

Have you seen anything like such a fluctuation in a water undertaking?—Never. Therefore I say that a well-secured water company like this is better than, and preferable to, Consols.

Mr. *H. F. Barnes*, the Secretary and Manager and Resident Engineer of the Company, gave particulars as to the plant and pipes, pumping, &c.

In cross-examination, witness admitted that for the last thirteen years very little had been spent in the way of repairs and renewal to mains.

Mr. BALFOUR BROWNE, on the opening of proceedings on the 6th inst., produced a letter which had been sent to the Parkstone Interests Association. It was addressed to the Association by only twelve of the inhabitants, who wrote: "Being dissatisfied with the high charges for the water supplied by the Poole Water-Works Company, we consider that the time has come when the whole matter concerning the water supply and the charges should be considered. Individual intervention being useless, we consider it would be a good thing if the Parkstone Interests Association should take the matter up." He contended that this letter referred only to the charges and not to the quality of the water.

Mr. HONORATUS LLOYD pointed out that the inhabitants wanted the whole matter taken up.

Mr. *Barnes*, in continuation of his evidence, said he could not admit that water from the Lilliput area was contaminated by manure put on the gardens in the district, though he admitted that the Company had no control over this matter. On one occasion there had been a real shortage of water at Lilliput, in consequence of which pumping had to be confined to twelve hours a day. Water was kept in store in order to give a twelve hours' supply.

Mr. VESEY KNOX drew attention to the petition alluded to by Mr. Balfour Browne, and read the covering letter from the Poole Interests Association, in which reference was made to the presence of iron in the water as a long-standing source of trouble, and a request made that steps should be taken to remove it.

Witness added that he said the matter would be attended to.

Sir *James Dewar* said he had been asked to deal with the water of the Poole Company, and to analyze, report upon, and advise as to its quality. From samples taken by himself and his assistants for chemical and bacteriological examination, it was found that, with some exceptions, all the waters acted more or less upon lead. The Company seemed quite familiar with this, because there were no lead pipes connecting with mains. Not one of the samples contained any of the particular *coli communis* which was typical of any kind of organic pollution. There was far better bacteriological filtration in Poole than the London water supply had. From a sanitary point of view, it was an excellent water.

In cross-examination by Mr. HONORATUS LLOYD, witness said that no pollution of any kind could percolate; and having regard to the fact that they were filtering at Poole at a slower rate than the London water supply was filtered, the water was well safeguarded. The rate of filtration could not be more than two-thirds or three-fourths of the present rate of the London supply. It would be almost a crime to abandon a supply of the kind at Parkstone owing to the scarcity of water in the country.

Dr. *S. Rideal* said he had had frequent occasion to examine the action of soft waters upon iron and lead, and had been called in to advise the Poole Company prior to the visit of Sir James Dewar. From his chemical and bacteriological examination of these waters, he confirmed the evidence of the last witness.

In cross-examination by Mr. HONORATUS LLOYD, witness said that if it was a question of choosing between a water supply derived from chalk and a sand supply, he was in favour of the latter. This was a fine sand which was not liable to fissure in the same way as chalk.

Mr. *Walter Andrews*, architect and surveyor, gave evidence as to the value of land in Poole. He considered that in the last five years the value of land at Parkstone had increased 30 per cent.

Mr. *Johnson*, the Engineer of the Brighton Water-Works Company, held that any fresh money spent on the Poole undertaking would simply be for the sake of appearances, and that everything which contributed to the excellence of the supply was there already.

Mr. BALFOUR BROWNE, in closing the case for the Company, said he abandoned the Foxholes and Constitution Hill as water supply sites, and merely asked for what was thought right for those places as building sites.

Mr. HONORATUS LLOYD, in opening for the Corporation, said the supplies of the Company had been increased from time to time. It was a piecemeal undertaking, carried on no doubt somewhat expensively by reason of this fact, and with corresponding disadvantages. Up to the time when the Company found it absolutely necessary, in order to maintain their supply, to provide a further source and went to Lilliput, he did not know that there was any complaint of the supply that had been given. But from the time the Company brought Lilliput into action, irritation and trouble arose. This went on for some years; the residents complaining eventually to the Town Council. Their complaints at the time were as to the charges made, and also as to the nature of the water. It was only during the last few months that the Company had improved the appearance of the water. Dr. Somerville had made a report, and eminent witnesses whom he would call would express their views as to the propriety of continuing to utilize some of the sources of supply. Since Lilliput was selected, the position was far worse than before, because there was a building estate growing up immediately to the north, and the Company had now a collecting ground which was a mere narrow strip. His witnesses, who had also made analyses, would state that, so far as their analyses went, there was no substantial evidence to-day of any pollution. Therefore he was not going to suggest that. But he was going to say that, having regard to their situations and nature and surroundings, the time was rapidly approaching when these sources would have to be abandoned. This was a very important issue in the case, because, when they dealt with figures, they would find that, so far as the net revenue was concerned, it was not a very large sum. The real discussion was as to the maintainability of the income. Taking

700,000 gallons as the maximum they would have to supply, if the evidence he was going to call satisfied them that there were sources that could not be safely used, the result would be that in a short time the Company would find themselves in a position of having to deal with a maximum demand of 700,000 gallons, with a supply of about 200,000 gallons. The figure he laid before them, instead of 30 years' purchase, was 23 years—it being the view of their advisers that the time was rapidly approaching when some of the sources would go out of use, and that they must therefore do the best they could to see what was the present value, having regard to the risk of pollution and contamination. The maintainable income of the Company had been put at £4604; but the amount the Corporation capitalized was £4018. This came about, in the first place, by certain additions that they sought to make to the expenditure; and by far the most important of them was in respect of repairs and renewals. They took the miscellaneous revenue at 15 years' purchase; and, lastly, they added, in respect of compulsory purchase, 1¾ per cent., which they considered ample—making a total of £88,177 5s. 9d. This was exclusive of the sites of the works.

Mr. *Otto Hehner* stated that, from careful examination of the gathering grounds at Poole, the soil was exceedingly porous. He did not agree that sand necessarily had any purifying or filtering capacity. The time was rapidly coming when the sand would not efficiently clean the water, and the whole collecting ground would be unfit for a water supply.

In cross-examination by Mr. BALFOUR BROWNE, witness said there was nothing much to complain of as to the quality at present; but no ground which was covered with houses was fit for a water supply unless there were impervious strata.

Dr. *Thresh*, who had also inspected the sources of supply, expressed the opinion that in time some of the works would certainly have to be abandoned.

Mr. *W. Cash*, the Secretary of the Bournemouth Gas and Water Company, gave evidence on the 8th inst. He said he had visited the Company's works. The Branksome Park area was also part of the Bournemouth Company's supply.

Mr. BALFOUR BROWNE explained that the Company had not put in any figure in regard to this. They had not the money to supply the district; and therefore he did not think it worth while to make any claim.

Witness proceeded to give evidence as to his examination of the books (which he said had not been well kept), and then dealt with the value of the undertaking.

In cross-examination by Mr. BALFOUR BROWNE, witness said he could not admit that money invested in a water company's stock was more profitable and secure than money in Consols. He insisted on the necessity for allowances for depreciation. He denied that the mains, pipes, and other plant were in a perfect condition.

Mr. *W. Matthews*, Consulting Engineer to the Poole Corporation, did not think the works of the Company had been well maintained. At first sight, they looked very old; and he thought they had been in existence much longer than on inquiry turned out to be the case. On the whole, he did not consider the present sources of supply satisfactory, and some of them would not be tolerated to-day. The Lilliput site, for instance, was decidedly objectionable. Two-thirds of the catchment area was now built over. This had two effects. First of all, the risk of pollution was greatly increased; and, secondly, there was a tendency to take from the amount of water for consumption by permitting it to get into the storm-water drains. Lilliput ought certainly not to be continued as a drainage ground. With regard to Waterloo, he considered that in the distant future it was not absolutely secured. The population and the water demands had both been increasing. In 1887, there was a shortage. Since then, however, there had been no exceptionally dry year; and since Waterloo had been established, there had been none at all. If the Company had been faced with a really dry year, even with Lilliput, they could not have supplied. Externally and structurally, the pipes were not in a bad condition; but many of them were heavily encrusted with carbonate of iron inside. His valuation of the Company's undertaking was as follows: Profit for 1906, £5307 18s.; less certain deductions, £4018 13s. 10d. This, capitalized at 23 years' purchase, gave £92,427 18s. 2d. Miscellaneous revenue, £32 14s. 5d., at 15 years' purchase, gave £490 16s. 3d.; making a total of £92,920 14s. 5d. The deductions necessary to render the works efficient were as follows: Service reservoirs, £2560; engine at Waterloo, £1000; replacing pipes, £1555; pointing, mixing gear, &c., £509; scraping 25,000 yards of pipes, £625—making £6260, or a sum of £86,660 14s. 5d., which, adding 1¾ per cent. for cost of re-investment (£1516 11s. 4d.), gave a total estimate of £88,177 5s. 9d.

Mr. BALFOUR BROWNE suggested that the witness's valuation had been made since the Company's evidence was given, and asked for the original valuation. Witness said he was not sure that he had it; but if he had, it should be produced.

In cross-examination, witness admitted that what he had stated as to the possibility of pollution at Waterloo might be said of any gathering ground in England. Subsequently he stated that he could not produce his original valuation. It was, however, about £79,000, which was the same as that of Mr. Cash, on which it was based. The second valuation was made since he heard the evidence for the Company. With regard to the discrepancies in his two estimates, he had only desired to be absolutely fair. He thought the second one was more reasonable than the first.

Mr. BALFOUR BROWNE: Don't you think there is something in compulsory sale from the sentimental point of view? In such a case you would allow something more than brokerage, stamps, and the loss of interest?

*Witness:* In such a case.

It is not true, as was put in the circular of the ratepayers, that there is a growing population?—Yes, I contend that there is a growing population.

If I am to part with my undertaking now, I get no prospective value at all. But if I hold on I might be able to pay back the £25,000 arrears of dividends. Is there not something to be said about compulsory sale there?—I don't know that you have any prospect of ever getting it.

And yet there is such a growth in the district that you are going to spend £50,000?—And you were going to spend £45,000.

Mr. *James Watson*, the Bradford Corporation Water Engineer, said he had never had such a difficult case to deal with as this. The yield of water seemed to be quite unknown; and the consumption was equally difficult to ascertain with accuracy. He did not consider that the works as a whole were effectively arranged, or that it was a well constructed undertaking. The works structurally had never been of a first-class description. The method of filtration at Lilliput was quite unsatisfactory, and the Springfield Road site ought to be entirely abandoned. Without Lilliput and Springfield Road, the Company would be immediately short of water in a dry year. The only available supply was Alderney and Waterloo. He would not have taken 23 years as the purchase price, but 28 years, had he been convinced that it was a well-secured undertaking with up-to-date works in good order. But they were not; they were patched-up works and starved in maintenance.

Professor *W. Whittaker* said he had seen the sources of supply. In his view, with the exception of Waterloo and Alderney, he did not think they should be continued as sources of public water supply when they could be easily replaced.

Mr. *E. L. Lane*, J.P., a surveyor and estate agent, of Bournemouth, gave details of his valuation of the land and buildings, making a total of £1772 12s. 6d.

Mr. HONORATUS LLOYD did not address the tribunal on behalf of the Corporation.

Mr. BALFOUR BROWNE, for the Company, said he did not think the way in which it had been sought to knock down the value of the undertaking would commend itself to the Umpire. First of all, they had to look at the undertaking as it was. The Corporation said that half of the works—Waterloo and Alderney—were good works, and should be continued. But if the Company's case was well founded (that the whole of their works were good), then the Corporation would be in the serious difficulty that they had induced the ratepayers of Poole to sanction a Bill for the expenditure of £50,000, which was clearly unnecessary. And in order to make a case to their own ratepayers and before this tribunal, they had elected to do something which was the most extraordinary thing he had ever heard in a case of this sort—to cut the undertaking in two, and say that half of it should be abandoned. This was the foundation of their case. As one of the Chemists had said, it would be a crime to abandon the water supply; it was beautiful, the treatment was perfect, and the examination, both chemical and bacteriological, proved that it was absolutely good. This was their own evidence; and yet, in order to knock down the value of the works and to get the 23 years' multiplier, they asked that works should be abandoned on no ground whatever, except that there were some buildings in the vicinity—the nearest houses being a quarter-of-a-mile away. There was not a suggestion that one of them had been polluted. In 1906, they had sufficient water to carry on with, and sufficient works to go on with all the year through. This was by far the best criterion they could work on. There had never been a scarcity except during one year, and there had not been one complaint of shortage, and even turbidity had not been made a point of. Whatever income was made out was secured very well indeed by their surplus power of charge. He contended that his figure of a maintainable income of £4604 was correct; and the question was how this was to be multiplied. The multiplier depended entirely on the security; and if there was a thing well secured, it was this undertaking. The first security they looked for in water-works was good and excellent water; and it was absolutely well secured on this. As to works, not a word of criticism had been said except that they looked rather old. But it was secured again by the increase of population; and he asked them to say that 30 years was a fair multiplier, and that compulsory purchase ought to be allowed. He asked them to allow for the value of the land they had abandoned—Constitution Hill and Foxholes—and also to take into consideration, in ascertaining the price, the money spent on capital account.

This concluded the proceedings; the Umpire reserving his award.

## Chard Gas Undertaking.

An application by the Chard Town Council to borrow £6313 for the gas undertaking was the subject of an inquiry on Thursday last by Mr. F. H. Tulloch, M.Inst.C.E., one of the Local Government Board Inspectors. Mr. C. F. Spencer, the financial adviser to the Corporation, explained that the original indebtedness of the Town Council on account of the gas undertaking was £52,870. They had paid £2200 into the sinking fund, so that the outstanding indebtedness was £50,670. The new loan was required for an extension, in order to make the works more efficient. Though it was stated that £6000 had been spent by the Gas Company just before the undertaking was acquired by the Corporation, they had found the works distinctly out of date. Mr. A. S. Brook, the Gas Manager, said part of the plant taken over had been erected in 1872, and was practically in ruins. During the two years in which the Corporation had been in possession of the works the consumption of gas had increased from 21 million cubic feet to 26 million per annum; and in order to meet this increased demand, additions to the plant had become absolutely necessary. Opposition to further expenditure was offered by ratepayers, on the ground that the undertaking was not remunerative. It was stated that the result of the first nine months' working was a loss of £900; and it was believed that a further deficiency would have to be met. Mr. Brook said the effect of the new plant would be to introduce more economical working; and there was every reason to believe that the undertaking could be carried on at a profit. The Inspector pointed out that although the extension was decided upon in March of last year, it was not until December that the Council applied for sanction to the loan.

The Tenterden and District Gas Company has been formed, with a capital of £5000, in 400 preference shares of £5 each and 300 ordinary £10 shares, to acquire the undertaking of the Tenterden Gas Company, Limited, and to manufacture and supply gas and electricity in and near Tenterden.

## STATE CONTROL OF WATER SUPPLIES IN AMERICA.

In the course of an article on the above subject in a recent number of "Engineering Record," the following remarks occur.

There is no longer any possible doubt that the people of America generally are fairly awake to the importance of water supplies, formerly neglected and befouled in the most thoughtless manner. Not only is the quantity of water available for potable purposes becoming scarce in some localities, except at the cost of enormously expensive works for developing distant supplies, but it does not require much careful consideration to detect in the conflicting claims of public and private interests to the same catchment basins for water, for potable and power purposes, the germs of bitter legal controversy and the possibility of many miscarriages of justice at times when popular feeling runs high. Then, again, the contamination of water by refuse of one sort or another is rapidly becoming a condition so widespread that already a number of States have passed laws regulating it more or less. It therefore seems likely that before very long the doctrine that the State should own the unappropriated water supplies within its boundary will not only be acknowledged generally, but will be the foundation on which some sort of State control of water supplies will rest, entirely apart from the control exercised as a measure to improve the condition of the public health.

There are few subjects which will be found to have more complex relations with other interests. In one State—Pennsylvania—where a Water Supply Commission was constituted some time ago, the law governing it was purposely so drawn that one of the Commission's most important functions was to investigate all the conditions governing the conservation and uses of water in the State, and to report such recommendations for further legislation as it considered desirable to bring about an equitable and economical development of the water resources. For this reason, the Commission's work is of special value, and their latest report is interesting, because the recommendations made therein do not lie so closely along the lines of engineering inquiry as some of those that have already been suggested, but relate rather to the far more important fundamental principles which ought to be settled as soon as possible in order that future legal complications over water rights may be reduced to a minimum. The Commission have apparently decided that their first duty is to ascertain what are the water resources of the State, how they are utilized at present, and what are the claims of various parties to water from the same source. Questions like these are really more important, except from the standpoint of public health, than those relating to contamination by refuse and similar related subjects. The latter are already under the control in Pennsylvania of a State Commission armed with strong powers, and consequently there is no danger that they will be dragged into the undue prominence they are receiving in some other States.

The subject gains added interest from the fact that, at the suggestion of Governor Stokes, of New Jersey, a Bill has been introduced in the Legislature of that State authorizing the appointment of a Water Supply Commission. In some respects this Bill is the most interesting evidence that has yet appeared of an awakened appreciation of the importance of the subject. It contains the customary requirements regarding the approval by the Commission of all projects for an additional water supply; but, in addition, the Commission are given power to require all public and private water-works organizations to report to them the quantity of water they supply, the rates charged, the communities to which they furnish water, and such other information as they may need for a proper supervision of the water supplies of the State and their utilization. In the Bill, special stress is laid on the necessity for each water-works organization to determine "by meters or other approved methods" the quantity of water used. In addition, the Commission are specifically charged with the duty of examining all projects for the storage of flood waters. The most important feature of the Bill is, however, that contained in the following clause:—

> Every municipality, water company, or private person now diverting the waters of streams or lakes, with outlets, for the purpose of a public water supply, shall make annual payments to the State Treasurer for all such waters hereafter diverted in excess of the amount now being diverted. And every municipality, water company, or private person not at present diverting surface water for such purpose, but who shall hereafter divert such waters, shall make annual payments to the State Treasurer for all water diverted in excess of 100 gallons daily for each inhabitant of the Municipality, as shown by the census of 1905. The amount of such payments shall be fixed by the Commission at a rate not less than $1 nor more than $20 per million gallons. The Commission shall fix a low rate in case flood waters are impounded by storage reservoirs and utilized, and shall increase the rate in case the dry season flow of the stream is encroached upon or diminished.

The Bill designates the manner of collecting these sums, which are to be credited to a fund for the conservation and control of the water supplies of the State. It should be stated, in explanation of the clause of the Bill just quoted, that the highest Court of the State has recently declared all surface waters to be the property of the State; and the latter is accordingly enabled to take a more positive stand regarding their use that might be practicable, without prolonged litigation, in States where this subject has not been adjudicated. Whether all the provisions of the Bill are couched in the best language to avoid future disputes, and ensure an equitable use of the waters of the State, can only be determined by careful consideration; but it is certain that its basic principles are deserving of the warmest support. If it contained provisions for ascertaining the extent of the water supplies of the State, and was extended so that the Commission would have authority over the uses of water for power and industrial as well as municipal purposes, it would be still better.

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**Bombay Gas Company, Limited.**—In the report to be presented at the meeting of this Company on the 2nd prox., the Directors state that in the twelve months ending the 31st of December last there was a satisfactory increase in the sale of gas, both to private consumers and for the public lamps. The receipts for residuals were also better than in the preceding year by £773. The profit for the year, as shown by the profit and loss account, amounts to £16,958—making, with £3363 brought forward, £20,321 available for dividend. The Directors state that the profit would have been greater but for a defalcation by a native collector, the whole of which has been provided for out of the revenue of the year. The interim dividend paid in December last absorbed £8400 of the available balance; and the Directors recommend a dividend of 3½ per cent., free of income-tax, making 7 per cent. for the year. This will leave £3521 to be carried forward.

## GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 214.

| Issue. | Share. | When ex-Dividend. | Dividend or Dividend & Bonus. | NAME. | Closing Prices. | Rise or Fall in Wk. | Yield upon Investment. |
|---|---|---|---|---|---|---|---|
| £ | | | p.c. | | | | £ s. d. |
| 590,000 | 10 | Apl. 11 | 10½ | Alliance & Dublin 10 p.c. | 20—21* | −½ | 5 0 0 |
| 268,324 | 10 | ,, | 7⅛ | Do. 7 p.c. | 14—15* | .. | 5 0 0 |
| 200,000 | 5 | Nov. 14 | 7 | Bombay, Ltd. | 6½—7½ | .. | 4 16 7 |
| 40,000 | 5 | ,, | 7 | Do. New, £4 paid | 5—5⅛ | .. | 5 1 10 |
| 50,000 | 10 | Feb. 28 | 14 | Bourne- 10 p.c. Pf. | 27½—28½ | .. | 4 18 3 |
| 51,810 | 10 | ,, | 7 | mouth Gas B 7 p.c. | 16½—17 | .. | 4 2 4 |
| 53,200 | 10 | ,, | 6 | and Water Pref. 6 p.c. | 15—16 | +½ | 3 15 0 |
| 380,000 | Stk. | ,, | 12½ | Brentford Consolidated | 250—255 | .. | 4 18 1 |
| 300,000 | ,, | ,, | 9⅜ | Do. New | 190—195 | .. | 4 17 5 |
| 50,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 117—122 | .. | 4 2 0 |
| 206,250 | ,, | Dec. 13 | 4 | Do. 4 p.c. Deb. | 101—104 | .. | 3 16 11 |
| 220,000 | Stk. | Mch. 14 | 11½ | Brighton & Hove Orig. | 220—225 | .. | 5 0 0 |
| 246,320 | ,, | ,, | 8½ | Do. A. Ord. Stk. | 160—165 | .. | 5 0 0 |
| 460,000 | 20 | Apl. 11 | 10 | British | 42½—43½* | +½ | 4 11 11 |
| 104,000 | Stk. | Feb. 28 | 6 | Bromley, Ord. 5 p.c. | 119—122 | .. | 4 18 4 |
| 165,700 | ,, | ,, | 4⅜ | Do. do. 3½ p.c. | 90—93 | .. | 4 16 9 |
| 500,000 | 10 | Oct. 12 | 7 | Buenos Ayres (New) Ltd. | 11½—12 | .. | 5 16 8 |
| 250,000 | Stk. | Dec. 13 | 4 | Do. 4 p.c. Deb. | 94—96 | +1 | 4 3 4 |
| 150,000 | 20 | Mch. 14 | 8½ | Cagliari, Ltd. | 24—26 | +1 | 6 6 11 |
| 100,000 | 10 | Sept. 27 | 10 | Cape Town & Dis., Ltd. | 14—15 | .. | 6 13 4 |
| 100,000 | 10 | Oct. 26 | 4½ | Do. 4½ p.c Pref. | 8½—9⅜ | .. | 4 14 9 |
| 50,000 | 50 | Nov. 2 | 6 | Do. 6 p.c. 1st Mort. | 51—53 | .. | 5 13 2 |
| 50,000 | Stk. | Dec. 28 | 4½ | Do. 4½ p.c. Deb. Stk. | 56—98 | .. | 4 11 10 |
| 157,150 | Stk. | Feb. 28 | 5 | Chester 5 p.c. Ord. | 109—111 | .. | 4 10 1 |
| 1,443,280 | Stk. | ,, | 5⅛ | Commercial 4 p.c Stk. | 107—110 | .. | 4 14 6 |
| 560,000 | ,, | ,, | 5 | Do. 3½ p.c. do. | 105—108 | .. | 4 12 7 |
| 475,000 | ,, | Dec. 13 | 3 | Do. 3 p.c. Deb. Stk. | 83—85 | .. | 3 10 7 |
| 800,000 | Stk. | ,, | 6⅜ | Continental Union, Ltd. | 120—123 | .. | 5 5 8 |
| 200,000 | ,, | ,, | 7 | Do. 7 p.c. Pref. | 138—143 | .. | 4 17 11 |
| 460,170 | Stk. | Aug. | 5⅛ | Derby Con. Stk. | 122—124 | .. | 4 8 9 |
| 55,000 | ,, | Jan. | 4 | Do. Deb. Stk. | 103—105 | .. | 3 16 2 |
| 486,090 | 10 | Jan. 31 | 11 | European, Ltd. | 24—25 | .. | 4 8 0 |
| 354,060 | 10 | ,, | 11 | Do. £7 10s. paid | 18—19 | .. | 4 6 10 |
| 15,203,110 | Stk. | Feb. 14 | 4⅛ | Gas- 4 p.c. Ord. | 95—97 | .. | 4 10 10 |
| 2,600,000 | ,, | ,, | 3⅜ | light 3½ p.c. max. | 87—89 | .. | 3 18 8 |
| 3,799,735 | ,, | ,, | 4 | and 4 p.c. Con. Pref. | 104—106 | −1 | 3 15 6 |
| 4,193,975 | ,, | Dec. 13 | 3 | Coke 3 p.c. Con. Deb. | 83—85 | .. | 3 10 7 |
| 258,740 | Stk. | Mch. 14 | 5 | Hastings & St. L. 3½ p.c. | 95—100 | .. | 5 0 0 |
| 82,500 | ,, | ,, | 6½ | Do. do. 5 p.c. | 116—119 | .. | 5 9 3 |
| 70,000 | 10 | Oct. 12 | 11 | Hongkong & China, Ltd. | 19½—20½ | .. | 5 7 4 |
| 4,940,000 | Stk. | Nov. 14 | 8 | Imperial Continental | 178—181 | .. | 4 8 5 |
| 473,600 | Stk. | Feb. 14 | 3½ | Do. 3½ p.c. Deb. Red. | 93—95 | .. | 3 13 8 |
| 184,602 | Stk. | Mch. 14 | 6 | Lea Bridge Ord. 5 p.c. | 117—122 | .. | 4 18 4 |
| 306,083 | ,, | Dec. 28 | 4 | L'rpool Unit'd Deb. Stk. | 110—112 | .. | 3 11 5 |
| 561,000 | Stk. | Feb. 28 | 10 | Liverpool United A | 223—225 | .. | 4 8 11 |
| 718,100 | ,, | ,, | 7 | Do. B | 164—165 | .. | 4 4 10 |
| 144,140 | Stk. | Feb. 14 | 7⅛ | Maidstone 5 p.c. | 142—147 | .. | 5 3 8 |
| 75,000 | 5 | Nov. 29 | 5 | Malta & Medn., Ltd. | 4¼—4⅜ | .. | 5 5 3 |
| 560,000 | 100 | Apl. 2 | 5 | Met. of 5 p.c. Deb. | 100—102 | .. | 4 18 0 |
| 250,000 | 100 | ,, | 4⅜ | Melbourne 4⅜ p.c. Deb. | 100—102 | .. | 4 8 3 |
| 541,920 | 20 | Nov. 14 | 3½ | Monte Video, Ltd. | 11½—12½ | .. | 5 12 0 |
| 1,775,892 | Stk. | Feb. 28 | 4⅜ | Newc'tle & G'tesh'd Con. | 107—109 | +3 | 4 4 10 |
| 406,025 | Stk. | Dec. 28 | 3½ | Do. 3½ p.c. Deb. | 96—97 | .. | 3 12 2 |
| 15,000 | 10 | Feb. 28 | 10 | North Middlesex 10 p.c. | 19½—20½ | .. | 4 17 7 |
| 55,940 | 10 | ,, | 7 | Do. 7 p.c. | 13—14 | .. | 5 0 0 |
| 300,000 | Stk. | Nov. 29 | 8 | Oriental, Ltd. | 150—155 | .. | 5 3 3 |
| 60,000 | 5 | Mch. 27 | 7 | Ottoman, Ltd. | 6—6½ | .. | 5 7 8 |
| 398,490 | 5 | Oct. 26 | 7 | Primitiva Ord. | 7⅛—7⅜ | −⅛ | 4 10 4 |
| 796,980 | 5 | Jan. 31 | 5 | Do. 5 p.c. Pref. | 5—5⅛ | .. | 4 15 3 |
| 488,900 | 100 | Dec. 1 | 4 | Do. 4 p.c. Deb. | 95—97 | .. | 4 2 6 |
| 1,000,000 | 10 | Oct. 12 | 8⅛ | River Plate Ord. | 13¼—13⅝ | +¼ | 5 16 5 |
| 312,650 | Stk. | Dec. 28 | 4 | Do. 4 p.c. Deb. | 95—97 | .. | 4 2 6 |
| 250,000 | 10 | Mch. 27 | 8 | San Paulo, Ltd. | 12½—13 | .. | 6 3 1 |
| 125,000 | 50 | Jan. 2 | 5 | Do. 5 p.c. Deb. | 48—50 | .. | 5 0 0 |
| 135,000 | Stk. | Mch. 14 | 10 | Sheffield A | 244—246 | .. | 4 1 4 |
| 209,984 | ,, | ,, | 10 | Do. B | 244—246 | .. | 4 1 4 |
| 523,500 | ,, | ,, | 10 | Do. C | 244—246 | .. | 4 1 4 |
| 70,000 | 10 | Oct. 26 | 10 | South African | 15⅝—16½ | .. | 6 1 3 |
| 6,350,000 | Stk. | Feb. 14 | 5⅛ | South Met., 4 p.c. Ord. | 122—124 | +1 | 4 8 9 |
| 1,895,445 | ,, | Jan. 16 | 3 | Do. 3 p.c. Deb. | 84—86 | .. | 3 9 9 |
| 201,720 | Stk | Mch. 14 | 8 | South Shields Con. Stk. | 158—160 | +1 | 5 0 0 |
| 605,000 | Stk. | Feb. 28 | 5⅛ | S'th Suburb'n Ord. 5 p.c | 120—123 | .. | 4 9 5 |
| 60,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 120—123 | .. | 4 1 4 |
| 117,058 | ,, | Jan. 16 | 5 | Do. 5 p.c. Deb. Stk. | 125—130 | .. | 3 16 11 |
| 502,310 | Stk. | Nov. 14 | 5 | Southampton Ord. | 107—112 | .. | 4 9 3 |
| 120,000 | Stk. | Feb. 28 | 6⅛ | Tottenham A 5 p.c. | 123—126 | .. | 5 3 2 |
| 398,940 | ,, | ,, | 5 | and B 3½ p.c. | 101—103 | .. | 4 17 1 |
| 137,500 | ,, | Dec. 28 | 4 | Edmonton 4 p.c. Deb. | 101—103 | .. | 3 17 8 |
| 182,380 | 10 | ,, | 8 | Tuscan, Ltd. | 10½—11 | .. | 7 5 6 |
| 149,900 | 10 | Jan. 2 | 5 | Do. 5 p.c. Deb. Red. | 102—104 | .. | 4 16 2 |
| 193,742 | Stk. | Feb. 28 | 5 | Tynemouth 5 p.c. max. | 105—107 | .. | 4 13 6 |
| 30,000 | Stk. | Feb. 14 | 8 | Wands- A 5 p.c. | — | .. | — |
| 255,636 | ,, | ,, | 6½ | worth B 3½ p.c. | 135—140 | .. | 4 12 10 |
| 75,000 | ,, | ,, | 5⅜ | and C 3½ p.c. | 111—113 | .. | 4 19 1 |
| 79,416 | ,, | Dec. 28 | 3 | Putney 3 p.c. Deb. Stk. | 79—82 | .. | 3 13 2 |
| 845,872 | ,, | Feb. 28 | 5⅛ | West Ham 5 p.c. Ord. | 101—104 | .. | 4 18 6 |
| 185,000 | ,, | ,, | 5 | Do. 5 p.c. Pref. | 120—123 | .. | 4 1 4 |
| 228,300 | ,, | Dec. 28 | 4 | Do. 4 p.c. Deb. Stk. | 102—105 | .. | 3 16 2 |

Prices marked * are "Ex div." † Next dividend will be at this rate.

## NOTES FROM SCOTLAND.

**From Our Own Correspondent.**

*Saturday.*

The Elgin Town Council had before them on Monday the report of the specialist whom they appointed to inspect the gas-works in the town. He stated that he was pleased with some of the additions to the works, which, in his opinion, displayed a forethought and a consciousness of what was recognized as the most economical and best in any well-regulated works at the present day. As was to be expected, some of the plant, if not antiquated, was too small for their present-day requirements, not to speak of future demands. The retort-bench, comprising four ovens, of seven retorts each, on the Hislop regenerative principle, was one of the best he had seen for works of their size. During the winter season, all the retorts required to be under fire. With extra storage capacity, three ovens would suffice, which would effect a saving both in coal and fuel, and lessen depreciation on the retorts themselves. The Council were recommended to consider the advisability of placing a governor upon the retort-bench, by which a gain of about 300 cubic feet of gas per ton of coal, and an increase of about ½ candle in illuminating power, would be obtained. The desirability of taking out two old purifiers, and replacing them by larger ones, was pointed out; and also the profit—about £155 a year—which would be obtained from the manufacture of sulphate of ammonia. The erection of a new gasholder was described as the *crux* of the whole question. At present the storage accommodation was only 80,000 cubic feet; whereas the maximum daily demand was as high as 200,000 cubic feet. A new gasholder was therefore necessary; and the question was where to put it. A site at Lossie Green, contiguous to the gas-works, was recommended, as it would keep the whole of the plant together, and room would be found for the erection of coal-stores, which are needed. After discussion, the Council instructed their Manager (Mr. J. Kay) to report to them upon the cost of a gasholder and other works recommended.

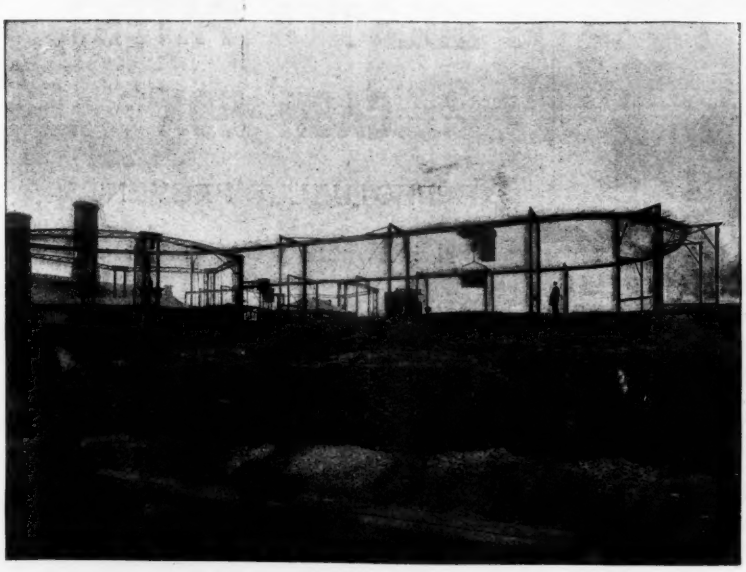
At the last meeting of the Dumfries Town Council, the report of a deputation who had visited the gas-works at Hamilton, Wishaw, and Uddingston, and examined the sulphate plants there, was submitted. It was recommended that sulphate plant, on the pressure system, be erected; and the Council, adopting the recommendation, instructed the Manager (Mr. G. Malam) to procure tenders for a 2-ton plant, and to submit them to the next meeting of the Council.

So great is the rivalry between the Corporation Gas and Electricity Departments in Dundee, that this week a meeting of the two Engineers and their Conveners was held, with a view to arriving at an arrangement which would abate competition. It was suggested that the one department should not touch on ground already occupied by the other, but that in the matter of new business competition should be free and unrestricted. The suggestion, however, did not meet with acceptance; the feeling being that each of the Engineers should be left free to develop his department, as rivalry tended to efficiency and increased business. The Electrical Engineer, while he welcomed competition, argued that he should be afforded facilities for advertising the product of his department equal to those given to the Gas Engineer, in the matter of a central show-room. The meeting acquiesced in the view of the Engineer, and resolved to recommend that a show-room for electric fittings be instituted.

The Polmont District Gas Company is among the latest to come into existence. The concern has started off in vigorous style, under the managership of Mr. James Campbell, and offers to be a success from the first. Last week, in pursuance of the enlightened policy with which they have begun, they held an exhibition of gas appliances (those of Messrs. R. & A. Main, Limited) in the Century Hall. It is reported that since the new gas-works were opened, gas has been introduced into a large number of houses in Laurieston, Polmont, and Redding; and the Company are desirous of bringing the advantages of cooking by gas before the consumers. Mr. A. P. Main, in opening the exhibition on Monday evening, enumerated the many advantages to be derived from the use of gas for cooking and heating, and introduced Miss H. H. Tuxford, of Manchester, who gave practical demonstrations of cookery that evening and during the week. Various forms of lighting by gas—incandescent and otherwise—were shown in the hall. It is stated that, as a result of the exhibition, a large number of cooking and heating stoves have been hired through the Company.

In the "Dundee Advertiser" of yesterday (Friday), there appeared the statement that "for the past five weeks there has been under trial at Newport a street-lighting device which promises to save large sums for corporations and firms using gas-lamps. It is the invention of Mr. Robert Macfarlane, who has been connected with the Dundee Gas Department for over thirty years. The Patent Office has accepted his application with the provisional specification. The invention is designated 'An improved pilot lighting device for incandescent gas-lamps.' It has been fitted to a street-lamp in Tayport Road, Newport, in a most exposed position—in fact, the place has so great a reputation for storms that it is locally known as Cape Wrath. The special features of the new device are that it ensures the lighting of the lamp without its being opened, and does away with the need of a bye-pass jet. It also protects the burner from the effects of wind, rain, dust, &c. In these ways, it will effect a great saving in incandescent mantles. In lamps where the lighting is effected by the opening of a door and inserting a torch, mantles are often broken in the lighting process, or by the slamming of the door after the lighting has been completed. To remedy this, bye-passes have been introduced in many lamps; but these have to be kept constantly burning, and involve a large consumption of gas. With Mr. Macfarlane's device, the whole operation of lighting can be performed without the lamplighter putting his torch inside the lantern at all. The torch is thrust between two stopcocks, and is then applied to the pilot lighting device, which lights the igniter, and it in turn lights the ordinary burner. The stopcock supplying the bye-pass is then turned off. The pilot device never misses fire, if it is properly managed; and it acts satisfactorily in stormy weather. Mr. Black, the Manager of the Newport Gas-Works, testifies that so far the device


# TEMPERLEY TRANSPORTERS



Temperley Transporter Plant for Storing Coke at the Paisley Corporation Gas-Works. The same plant is used for screening and loading into delivery carts.

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has done its work without a hitch. In times of storm, it acts quite satisfactorily. Mr. Macfarlane estimates that the invention will save about 80 per cent. on time, mantles, and bye-pass burning. It can be produced at small cost, and should save its cost in the first year of use; while it is of durable construction. He has been at work on the invention for between four and five years, and has gradually simplified and cheapened it. Altogether, this local invention should have a great future before it."

The Kilmarnock Gas Committee have reported to the Town Council this week that a Sub-Committee, having considered as to the best method of collecting the money from prepayment meters, had reported that there were now over 700 of these meters in use in the burgh, and 1100 cookers and heating appliances let on hire by the Corporation; and that they were of opinion that a special man should be appointed, whose duties would be to collect the money from the meters and to take general supervision of the cooking and heating appliances on hire. They recommended to this effect; and it was agreed to. It was reported that, as a result of the gas exhibition which was held from the 18th to the 22nd ult., about 150 gas cooking appliances and 24 heaters had been hired out. Mr. Turnbull moved, in terms of notice given last month, that a Special Committee be appointed to inquire into the working of the Gas, Electric, and Tramway Departments, with the view of ascertaining whether greater economy or efficiency could be attained in the working of them. The motion, being one for inquiry, was agreed to unanimously; and a Committee was thereupon appointed.

In the Aberdeen Town Council on Monday, the Water Committee recommended that the two service reservoirs at Mannofield and Cattofield be covered with cement concrete continuous arching, at a cost of £23,600. The reasons for the proposed step were that, there being dwelling-houses in the neighbourhood, smoke and other contaminations get into the water; that dust blows into the reservoirs from the roads; and that sea gulls defile the water. There was a strong set against the proposal, which was regarded as extravagant; and the Council, by a majority, in view of the fact that the question of obtaining an improved water supply is now under consideration, deferred the subject in the meantime.

**Light and Vegetation.**—The question of the influence of electric light on vegetation in the London squares has lately been placed before a horticultural expert by a representative of the "Daily Express." The expert stated that it is common knowledge that trees and plants growing near to street-lamps, whether electric or gas, are always more forward, and apparently more flourishing, than those which are in the dark at night time. "Plenty of light is essential to good growth," he said; "and in the case of the trees growing close to the public lamps in the London squares, they have practically no night. In suburban roads and front gardens, it is constantly noticed that the first trees to put out their leaves are generally those nearest the lamp-posts."

## CURRENT SALES OF GAS PRODUCTS.

**Sulphate of Ammonia.** LIVERPOOL, *April* 20.

The market has been quiet at all points, and the tendency of prices is still in favour of buyers. There has been more anxiety on the part of makers to dispose of their production, fresh orders being scarce, and buyers indifferent. Home demand, however, continues to be on a satisfactory scale. The closing prices are £11 16s. 3d. per ton f.o.b. Liverpool, £11 17s. 6d. per ton f.o.b. Leith, and Hull nominally £11 15s. per ton f.o.b. There has again been large inquiry for delivery ahead; but, buyers' views being still for the most part below current prompt prices, actual business has been unimportant. There are sellers of July-December and of May-August at £11 17s. 6d. per ton f.o.b.; but foreign buyers will not pay the equivalent.

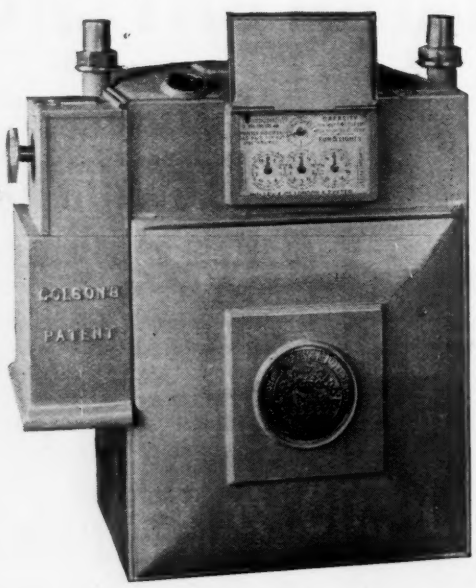
**Nitrate of Soda.**

This article is rather quiet; and the closing quotations are 11s. 4½d. per cwt. and 11s. 10½d. for 95 per cent. and refined qualities respectively.

**Tar Products.** LONDON, *April* 20.

Markets are unusually quiet for this time of the year, and there is little of interest to report. In pitch, the principal London makers are well sold, and not inclined to consider further business except at an advance upon market prices; but outside makes could be secured at 25s. 6d. per ton. On the east coast, business has again been done in the finest makes at 25s. 6d. to June; while at the outside ports, under this figure has been accepted. In the Liverpool districts, makers would still take 24s. 6d. for May-June delivery; while in Manchester there are sellers at 24s. There is no change in creosote. London makers are so well sold as to be indifferent for the time being, though some quantity is reported to have been sold at 2 5/16d. In the Midlands, business is stated to have been done at 2⅜d., but most makers ask 2½d.; while in the North, from 2d. to 2⅛d. may be taken to be the ruling value. Benzol is fairly firm in London; the makers having sold largely a little time ago. In the North it is very quiet, Very low prices have been accepted, and consumers do not appear at all anxious to buy. Fifty-ninety per cent. is dull in sympathy with nineties, and consumers have refused to pay 9¼d. naked delivered to their works. Solvent is firm in London and steady elsewhere, though makers report that sales are difficult to negotiate. Carbolic is very quiet. At makers' works, 1s. 7d. and 1s. 7¼d. have been accepted for delivery over the next two or three months; but English consumers refuse to offer more than 1s. 7d. to the end of the year. Fifties have been sold at 1s. 5¼d. ex makers' works for delivery to end of June. Crystals are very quiet, and orders exceedingly scarce. There is nothing of interest to report in anthracene.

The average values during the week were: Tar, 14s. 9d. to 18s. 9d. Pitch, London, 25s. 6d. to 26s.; east coast, 25s. to 25s. 6d.; west

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coast, 24s. to 24s. 6d. Benzol, 90 per cent., 9⅜d. to 10⅜d.; 50-90 per cent., 10⅛d. to 11⅛d. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4½d. to 4⅝d.; solvent naphtha, 1s. 2d. to 1s. 3½d.; heavy naphtha, 1s. 2d. to 1s. 4d. Creosote, London, 2⅜d.; North, 2d. to 2⅛d. Heavy oils, 2¾d. to 2⅞d. Carbolic acid, 60 per cent., 1s. 8d. to 1s. 8¼d. Naphthalene, £5 10s. to £10 10s.; salts, 35s. to 40s. Anthracene, "A" quality, 1⅛d. to 1⅝d.

**Sulphate of Ammonia.**

Markets have been very dull during the past week, and prices have had a downward tendency. The principal Gas Companies are well sold for this month; but for May-June would probably accept £11 17s. 6d., on their special terms. Ordinary makes, however, could be secured at under this upon the same basis. In Leith, business is reported at £11 16s. 3d. for prompt delivery; and in Liverpool, at £11 15s. No business is reported in Hull; but the value there does not exceed £11 13s. 9d. for ordinary makes. For forward delivery, dealers only appear willing to do business at a discount on prompt figures.

**Hucknall Huthwaite Gas Supply.**—An important piece of business was transacted at the meeting of the Hucknall Huthwaite Urban District Council last Wednesday. On that occasion, the seal of the Council was affixed to the assignment of the gas undertaking; the deed having been previously read. The Clerk was instructed to make arrangements for a conference to be held between representatives of the Council and Directors of the Blackwell and South Normanton Gas Company, for the purpose of handing over to the latter Company the cheque for the sum of £5724 5s. in payment of the purchase-money of the undertaking, the compensation for the Company's mains outside the district (for which they had no further use), and the Company's taxed costs of the arbitration litigation. For the termination of the gas supply to the parish of Hucknall, the Clerk was authorized to tender twelve months' notice to the Company in question, with a request that it should be accepted as from the 25th ult.

**Colwyn Bay Gas Supply.**—At the meeting of the Colwyn Bay Urban District Council last Tuesday, the Chairman of the Lighting Committee (Mr. John Williams) reviewed the work done during the past year in connection with the gas-works. He stated that 60,209,000 cubic feet of gas were made, 4½ miles of mains laid, and 557 meters and 314 gas stoves and cookers fixed. The benefits derived by the town from the Gas Department were very large. The department paid £550 towards the street lighting, besides only charging the town 2s. per 1000 cubic feet, instead of 3s. 4d., for the gas used. The cost of the public lighting to the ratepayers was £230 instead of £780 as formerly. The cash received during the year amounted to £11,061, or only £260 less than the estimate. It was hoped to get the new sidings at the gas-works ready by next year, which would mean a saving of hundreds of pounds per annum. The high rate of interest in the Money Market was the reason the work had not been completed earlier.

## COAL TRADE REPORTS.

**Lancashire Coal Trade.**

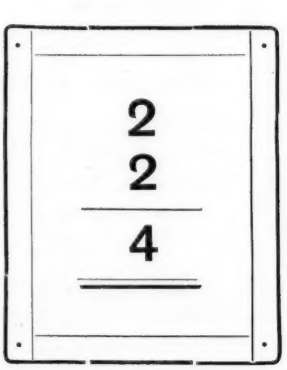
There are practically no changes to report in the condition of the Lancashire coal trade from the position a week ago. The house coal trade continues to grow weaker; but considering the large output, business is fairly satisfactory. The various classes of house coal are selling at higher prices than for a long time past. The best brands fetch 20s. per ton. A considerable tonnage of house coal is being sent into the country from Yorkshire. The request for steam coal is still very brisk; and gas coal and cannel are meeting with a good inquiry. Coke for furnace purposes is in good demand at high prices, and from both Lancashire and Yorkshire a continuous supply is being sent to the iron smelting districts. There is no change in the average quotations for coal at the pits as published last week.

**Northern Coal Trade.**

In the coal trade, there has been a quieter tendency; but the beginning of the Baltic shipments seems to be stiffening the market, more especially as far as steam coals are concerned. Best Northumbrian steams are quoted from 14s. 6d. to 15s. per ton f.o.b., second-class steams are about 14s., and steam smalls are firm at 9s. 6d. to 10s. The collieries are working well, with a good output; and—with slight exceptions through delay of vessels—this is promptly taken up. In the gas coal trade, the consumption is rather less; but some of the companies are taking up full deliveries on old contracts, because the prices are below those that are current. Durham gas coals vary from about 12s. 3d. to 13s. 3d. per ton f.o.b., according to quality, for early shipment. As to the large Southern contracts, it is believed that there are negotiations entered into again, but the results are not yet known. There have been several sales of gas coal for home and foreign use—in one of which 13s. per ton has been paid for a fair quantity, to be delivered in the next six or seven months. Other contracts are expected to be soon closed. Coke is steady; and gas coke is less plentiful. The price for good qualities of gas coke varies from about 14s. 9d. to 15s. 6d. per ton f.o.b.

**Scotch Coal Trade.**

Trade is not quite so active, the high prices having led to something of a check. This, however, is expected to be only temporary, as, with the impending opening of the Baltic—which is later than usual this year—there will be an augmented demand. Splint is in request. Steam coal is the most plentiful. The prices quoted are: Ell 12s. to 13s. 6d. per ton, splint 13s. to 13s. 3d., and steam 11s. 9d. to 12s. The shipments for the week amounted to 302,212 tons—a decrease of 1215 tons upon the previous week, and of 13,196 tons upon the same week of last year. For the year to date, the total shipments have been 3,749,874 tons—an increase of 181,195 tons upon the corresponding period of 1906.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## Dartmouth Water Supply.

An inquiry was held at Dartmouth last Thursday, by Mr. A. A. G. Malet, of the Local Government Board, respecting an application by the Town Council to borrow £5000 for improving the water supply. The Town Clerk (Mr. S. J. Pope) explained that the town had been short of water, and that last October the supply ran so low that only 59,000 gallons per day were available, or about 8½ gallons per head of the population. It was now proposed to construct a reservoir with a capacity of 300,000 gallons, and to acquire on lease for 99 years a new source of supply in the neighbourhood of the Old Mill Valley. Of the water from the new source, 20,000 gallons would gravitate into the existing low-level reservoir and 120,000 gallons would be pumped into the new one for the high levels of the town, which now had no supply. It was hoped that when the new supply became available, the service would be continuous, and the cisterns now in use abolished. A supply would also be furnished to the Royal Naval College, which could not now be served, as it stood above the level of the existing reservoirs. The Surveyor (Mr. T. W. Joyce) gave details of the scheme, and said that, as the Admiralty required it, the water would be filtered; otherwise he did not think the Council would have considered filtration necessary. Mr. F. J. Voisey, a ratepayer, complained of the high price which was to be paid for the additional water. The Town Clerk explained that the Corporation could not obtain borrowing powers for the purchase of the 750 acres comprising the catchment area, and if they could the Trustees of the estate could not sell. Mr. W. J. Clarke, the Superintending Civil Engineer to the Admiralty, said it was important that the supply of water to the Royal Naval College should be furnished at an early date. The Council's agreement named July 24 as the day on which it was to be available; and it was hoped they would be in a position to supply water by that time.

**Kimberley Water-Works Company, Limited.**—The 27th annual general meeting of this Company was held at the Cannon Street Hotel last Wednesday—Mr. James Jackson presiding. In moving the adoption of the report, the Chairman said that, generally speaking, the Company had enjoyed a very good year. The shortage of revenue was somewhat greater than the decrease in the consumption of water, owing to the fact that the rather lower scale of payment under the new concession had been in force throughout the year. Considerable trouble had been experienced owing to the condition of the water of the Vaal River, which throughout the latter part of the year had been exceedingly turbid and thick—so thick, indeed, that the filters were unequal to the proper treatment of the water. Improved equipment to cope with the difficulty had been introduced, with satisfactory results. It was the Directors' intention in November next to pay an interim dividend for the six months—an event which had not happened in the Company's history during the past fourteen years. Mr. W. Mendel seconded the motion, which was adopted.

## Fatality at the Llanelly Gas-Works.

Last Tuesday morning, two men named James and Thomas, who had for several days been engaged in repairing some of the retort-furnaces at the Llanelly Gas-Works, were discovered overpowered in the subway in front of the furnaces; their position and appearance justifying the conclusion that they had been suffocated. James was against the furnace, while Thomas was lying in the subway, but close to the furnace door. Medical aid was at once summoned; but animation could not be restored. At the inquest on Thursday, a stoker deposed to finding the bodies, and stated that he did not feel any bad effects from being in the subway. There was nothing strange in the atmosphere. In answer to the Coroner (Mr. Buckley Roderick), witness said the ventilation of the subway had lately been improved by an alteration. He could not account for the accident; but gas might have come from No. 1 furnace, where water gas was being generated. The medical man who was summoned (Dr. D. J. Williams) said he had not the slightest doubt, from the appearance of the men, that death was due to poisoning by carbon monoxide, which possibly permeated through the bricks of the furnace, if there was hammering going on in the next one. Mr. T. Acland, the Manager of the Gas Company, said that he considered the ventilation in the subway satisfactory. He had not the remotest idea as to how the gas reached the men. Asked if he agreed with the doctor that the gas came from the adjoining furnace, witness said he did not wish to differ from any opinion, because it was a mystery to him how the gas got to the deceased. He had never heard of a similar accident during the 37 years' existence of the gas-works; and he did not know of anything that could have been done to avert it. Mr. D. R. Edmunds, on behalf of the Company, expressed the regret of the Chairman and Directors, and likewise of Mr. Acland, for what had occurred. He said both of the deceased were good workmen, and bore excellent characters. The management were convinced that there was nothing by which they could have foreseen the danger. He had been authorized to promise that anything human ingenuity could do to find the cause of the escape of the gas and in order to avoid the recurrence of a similar accident would be done. The Jury returned a verdict of "Accidental death."

**Successful Experiment in Road-Watering.**—So successful was an experiment made by the Public Health Committee of the Leyton Urban District Council in the height of last summer, that it is again proposed to use a mixture of tar and water for sprinkling certain of the streets. The mixture was employed in the proportion of 20 gallons of tar to 400 gallons of water; and it was found to be completely successful from an economic and sanitary point of view. Besides minimizing the danger of the contamination of milk by dust, the road on which the liquid was used required watering only once every two or three days; and on a hot, dry day, when the wind was high, there was very little dust to be seen.


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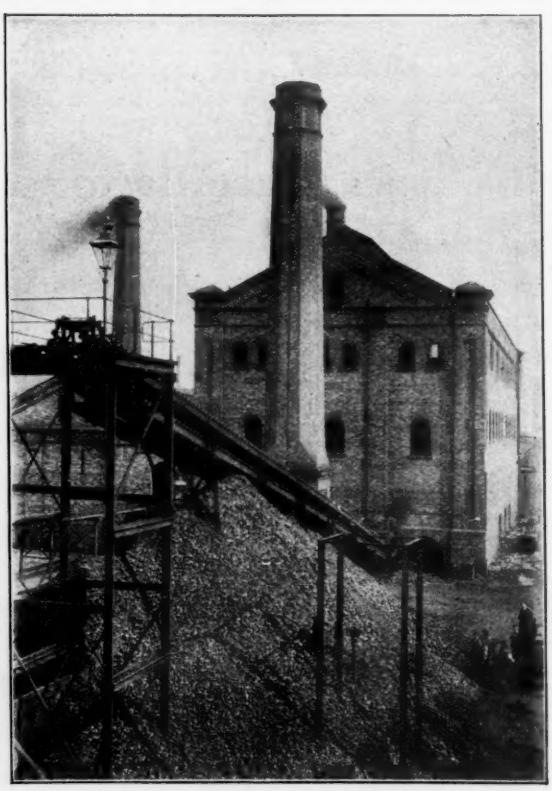

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**Suicide by Inhaling Gas.**—Last Saturday, an inquest was held on Mr. Wallis Mackay, a cartoonist, who was found in his rooms in Rutland Street, S.W., the previous Thursday, apparently suffocated by gas. The evidence showed that deceased had been troubled about business affairs; and a policeman, in whose house he lodged, said he had not been able to pay his rent and consequently had been given notice to quit. Witness heard him put two pennies into the gas-meter on the Monday before he was found. The Jury returned a verdict of "Suicide during temporary insanity."

**Further Capital for the Ascot Gas and Electricity Company.**—The Ascot District Gas and Electricity Company, in a circular to the shareholders, state that they have obtained tenders for the necessary plant to enable the Company to supply electricity in the neighbourhood of Sunningdale and Sunninghill; and it will be necessary to raise additional capital for this work, and also to pay for certain extensions in connection with the gas plant. An extraordinary meeting will be held on Wednesday, May 1, for the purpose of authorizing the Directors to raise money by the issue of £8000 of 4 per cent. perpetual debenture stock and 1000 7 per cent. ordinary shares of £10 each.

An exhibition of the gas appliances of Messrs. R. & A. Main, Limited, was held at Blantyre last week, with Miss E. M. Dods, of Dundee, as lecturer.

The Barrow Corporation Gas Department have placed a contract with the Richmond Gas Stove and Meter Company, Limited, for the sole supply of slot cookers and for ordinary cookers.

The Woking District Gas Company, Limited, have placed an order with the Richmond Gas Stove and Meter Company, Limited, for fitting up automatic installations. They are also undertaking a thorough canvass of the district.

At the meeting of the Bermondsey Borough Council last Tuesday, the Surveyor reported that the whole of the flat-flame burners had been converted into incandescent lights; and that owing to the fact that the new burners required more attention than the old ones, the work allocated to each man was more than he could manage. He therefore suggested that an extra man be engaged at 30s. per week, in order to allow the other men more time for the better cleaning of the lanterns, so as to maintain the efficiency of the light. This was agreed to.

## WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

**Situations Vacant.**

GAS-FITTER. No. 4762.
METER REPAIRER, GAS FITTERS, MAIN AND SERVICE LAYERS, AND STOKERS. Quebec Gas Company.

**Situations Wanted.**

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**Plant (Second-Hand), &c., for Sale.**

ENGINE (VERTICAL). Whitstable Water-Works.
PURIFIERS, &c. Eastbourne Gas Company. Tender by May 8.
PURIFIERS, &c. Perth Gas Department.
PURIFIERS, &c. Stratford-on-Avon Gas Department.
RETORT FITTINGS, STOKING MACHINERY, CONDENSERS, SCRUBBERS, PURIFIERS, STATION METER, &c. Edinburgh and Leith Gas Commissioners.
WATER-METERS. Wey Valley Water Company.

**Stocks and Shares.**

BARKING GAS COMPANY. May 7.
EAST GRINSTEAD GAS AND WATER COMPANY. May 7.
TENDRING HUNDRED WATER COMPANY. May 7.
UXBRIDGE GAS COMPANY. May 7.

**TENDERS FOR**

**Coal and Cannel.**

ACCRINGTON GAS AND WATER BOARD. Tenders by May 6.
HAWKHURST GAS COMPANY. Tenders by May 7.
NORTHWICH GAS COMPANY. Tenders by May 9.
STAMFORD AND ST. MARTIN'S GAS COMPANY. Tenders by May 14.
ULVERSTON GAS DEPARTMENT. Tenders by May 2

**Fire-Clay Goods.**

TEIGNMOUTH GAS DEPARTMENT. Tenders by May 7.

**Graphite (Wanted).**

RUDOLF MOSSE. Hamburg.

**Ironwork, &c.**

COVENTRY GAS DEPARTMENT. Tenders by April 22.

**Pipes, &c.**

GLOUCESTER GASLIGHT COMPANY. Tenders by May 3.

**Oil for Gas Making.**

MANCHESTER GAS DEPARTMENT. Tenders by May 2.

**Retort-Bench, &c.**

TEIGNMOUTH GAS DEPARTMENT. Tenders by May 7.

**Tar and Liquor.**

ACCRINGTON GAS AND WATER BOARD. Tenders by May 6.
EASTBOURNE GAS COMPANY. Tenders by May 8.
ULVERSTON GAS AND WATER DEPARTMENT. Tenders by May 2.

## NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

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**Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.**

**Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.**

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
**Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.**


**OXIDE OF IRON.**

**O'NEILL'S OXIDE**
For GAS PURIFICATION.
LARGEST SALE OF ANY OXIDE,

**SPENT OXIDE PURCHASED IN ANY DISTRICT.**

GAS PURIFICATION & CHEMICAL CO., LD.,
PALMERSTON HOUSE,
OLD BROAD STREET, LONDON, E.C.

**WINKELMANN'S**
**"VOLCANIC" FIRE CEMENT.**
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

**BROTHERTON & CO., LIMITED.**
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

**PATENTS AND TRADE MARKS**
PUBLICATIONS, "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

**GAS PLANT for Sale—I can always offer** NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

**J. & J. BRADDOCK (Branch of Meters** Limited), Globe Meter Works, OLDHAM, and 54 & 47, Westminster Bridge Road, LONDON, S.E.
WET AND DRY GAS-METERS, PREPAYMENT METERS, STATION METERS, AND GOVERNORS.
REPAIRS RECEIVE PROMPT ATTENTION.
Telephones: 254 Oldham, and 2412 HOP, London.
Telegrams:—
"BRADDOCK, OLDHAM," and "METRIQUE, LONDON."

**DUTCH OXIDE OF IRON.**

**SPENT OXIDE PURCHASED IN ANY DISTRICT.**

**THE First Dutch Bogore Co., Ltd.,**
HOLLAND.
*General Manager (for England and Wales)*—
CHARLES E. FRY, LEAMINGTON,
*General Manager (for Scotland)*—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

**"VITERNUS" METALLIC PAINT FOR GAS-WORKS PLANT.**
**JOHN E. WILLIAMS AND CO.,**
LOWER MOSS LANE,
MANCHESTER, S.W.
Telegrams: "ENAMEL." National Telephone 1759.

**GAS TAR wanted.**
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, GLASGOW, LEEDS, LIVERPOOL, WAKEFIELD, AND SUNDERLAND.

**SULPHATE OF AMMONIA**
SATURATORS and all LEAD and TIMBER WORK in Connection with Sulphate Plants.
We guarantee promptness, with efficiency for Repairs.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS BOLTON.
Telegrams: SATURATORS, BOLTON. Telephone 0848.

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(NATURAL.)
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**BALE'S FIRE CEMENT.**
**PAINT FOR GAS-WORKS.**
**BALE & CHURCH,**
5, CROOKED LANE, LONDON, E.C.

**SULPHURIC ACID.**

**SPECIALLY prepared for the Manu**facture of SULPHATE OF AMMONIA.
**SPENCER, CHAPMAN, & MESSEL, LTD.**
with which is amalgamated WM. PEARCE & SONS, LTD.
36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.
Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341, AVENUE.

**BY adopting Cripps's Bye-Pass Valves** inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.
Sole Makers: C. & W. WALKER, LIMITED, Midland Iron Works, Donnington, near Newport, SHROPSHIRE.

**INCREASE YOUR MAKE.**
**SEND for Particulars of the "RAPID"** Carburettor. Why be short of Gas when you can stretch the make from 1000 to 2000 cubic feet per ton, without any difficulty?
BIGGS, WALL, & Co., 13, Cross Street, Finsbury Pavement, LONDON.

**HYDRATED OXIDE OF IRON.**
**PREPARED from Pure Iron.**
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market,
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

**ROBERT DEMPSTER & SONS, Ltd.,** Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, Rose Mount Iron-Works, Elland.

**SULPHURIC ACID for Sale, specially** suitable for making Sulphate of Ammonia. Brotherton and Co., Ltd., Chemical Manufacturers. Works: Birmingham, Leeds, Wakefield, and Sunderland.

**THE KEITH LIGHT.**

4000 INSTALLATIONS IN DAILY USE.

**SEE illustrated advertisement in next** week's issue.

James Keith and Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.

**GAS OILS.**

**MEADE-KING, ROBINSON, & CO.** Represent the Strongest Independent Refineries in America; also Petroleum Spirit for Gas Enrichment. 18, Exchange Street, Manchester, and 11, Old Hall Street, Liverpool.

**BENZOL**

AND

**CARBURINE FOR GAS ENRICHING.**

ALSO

**THE MAXIM PATENT CARBURETTOR.**

For Prices, &c., apply to

THE GAS LIGHTING IMPROVEMENT CO., LTD.,
7, Bishopsgate Street Without,
LONDON, E.C.
Telegraphic Address: "Carburine, London."

**BRISTOL RECORDING GAUGES AND THERMOMETERS.**

J. W. & C. J. PHILLIPS, 23, College Hill, London, E.C., and 7, Park Square, Leeds.

**GAZINE—A radical Solvent and Pre**ventative of Naphthalene deposits, and the Automatic cleaning of Mains and Services.
It is also used for the Enrichment of Gas, and has an illuminating value double that of 90 per cent. Benzol.
Supplied by C. Bourne, West Moor Chemical Works, Killingworth, or through his Agent, F. J. Nicol, Pilgrim Street Chambers, Newcastle-on-Tyne.
Telegrams: "Doric," Newcastle-on-Tyne. National Telephone No. 2497.

**THE TAR (PATENTS) SOLIDIFYING** AND DISTILLING CO., LTD., of 15, Manson House Chambers, London, E.C., GRANT LICENCES to Gas-Works, Collieries, and others to use their process. Particulars of the Secretary.

**AMMONIACAL Liquor wanted.** Brotherton and Co., Ltd., Ammonia Distillers. Works: Birmingham, Glasgow, Leeds, Liverpool, Wakefield, and Sunderland.

**NOTICE to Gas-Works—Wanted, First-**Class RETORT GRAPHITE up to 500-600 Tons. To be delivered in suitable quantities net f. o. b. to next Shipping port.
State lowest Terms to "Retortengraphite," care of Rudolf Mosse, Advertising Agency, Hamburg,

**AUSTRALIA—Commercial Gentleman,** thoroughly experienced in the Gas-Fittings Industry, having Travelled Great Britain for the past nine years, and about to leave for Australia, is prepared to Represent First-Class Houses (Gas-Fitting or Hardware). Smart, Energetic, and Businesslike.
Address No. 4761, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

**WANTED, by Premium Pupil, very** shortly completing Indentures under prominent Gas Engineer, a Situation as ASSISTANT-MANAGER, or MANAGER of a small Gas-Works. Thorough practical knowledge of General and Office routine, including Dellwik Water Gas, Vertical Retorts, and Laboratory Experience.
Address No. 4763, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

**WANTED, immediately, One Meter** REPAIRER, Three GAS-FITTERS, Three MAIN AND SERVICE LAYERS, and Three Hand STOKERS for Retort-House.
Applicants must be thoroughly competent in their respective lines and well recommended none others need apply.
Steady employment and good wages to satisfactory men.
Passage money will be advanced if necessary. Quebec Gas Company, Quebec, Canada.

**JOHN ROMANS & SON, Newton** Grange, Mid-Lothian.—Mr. D. P. Romans, having accepted an Appointment, retired from the above Firm on the 1st of January, 1907. He begs to THANK all Customers for their support during his association, and trusts their confidence in his father will continue.
Business as Supplier of Coal, Pipes, Fire-Clay Goods, &c., will be carried on as usual.

**TO Gas-Fitters—Wanted an Improver** accustomed to Compo. and Iron Fitting, Cookers, Slot Meters, &c.
Apply, by letter, stating Age and Wages expected, with References, to No. 4762, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

**No. 4759.**

**APPLICANTS are hereby Thanked; but** no more Applications are required. The matter will be under consideration for Two Weeks after this date. It is not worth consideration of many who have applied, as while someone of varied and considerable Experience is required for further exceptional developments on right lines, the business at present is under 100 Millions make per annum.

**PERTH CORPORATION.**
(Gas Department.)

**PURIFIERS (Two) for Sale—Practi**cally new. Dimensions, 20 feet by 20 feet by 5 feet. Price to be submitted for the Purifiers as they stand, including Valves, patent Hurdle Grids, and Lifting Gear.
The Plant may be seen and further Particulars obtained from

W. B. M'Lusky,
Engineer and Manager.

Gas-Works, Perth,
March 8, 1907.

**STRATFORD-UPON-AVON CORPORATION.**
(Gas Department.)

**THE Gas Committee have For Sale Two** 12-feet square PURIFIERS, with Lifting Apparatus, Dry Centre Valve for Four Purifiers, 12-inch Connections. All in good Condition. No reasonable Offer refused.
Further Particulars can be obtained upon application to—

J. S. Cranmer,
Engineer and Manager.

April, 1907.

**EASTBOURNE GAS COMPANY.**

SURPLUS PLANT TO BE SOLD.

**FOUR 24 feet Square Purifiers, with** Traveller complete and 16-inch Connections. Two of the Purifiers have 2 ft. 6 in. Lutes, and the other two have 1 ft. 6 in. Lutes. The Valves will not be included in the sale.
The Purifiers must be removed by the purchasers at their own cost within six weeks of acceptance of Tender.
There is a private branch between the Company's Works and the London Brighton and South Coast Railway at Eastbourne Station.
The Purifiers can be inspected and all Particulars obtained on application to the Engineer, Mr. John Hammond, at the Gas-Works, Eastbourne; and Drawings can be seen at the Offices of Messrs. H. E. Jones and Son, Palace Chambers, Westminster.
Tenders should be sent, not later than the 8th of May, addressed to the Directors of the Company at their Offices, Terminus Road, Eastbourne.

(Signed) James S. Garrard,
Secretary.

**WATER-METERS FOR SALE, CHEAP.**

**FOUR 3-inch Positive Water-Meters of** an approved make, Second-Hand, for disposal. What Offers?
Address Arthur H. Cooper, Manager, Wey Valley Water Company, Farnham.

**VERTICAL Engine for Sale, 12-inch** Cylinder, 20-inch Stroke; Crank Shaft 4¼ inches diameter; Large Fly-Wheel and Driving Pulley. All in splendid condition ready for immediate use.
Price, £52 for quick sale.
Seen by appointment.
Wm. Wyver, Water-Works, Whitstable.

**GLOUCESTER GASLIGHT COMPANY.**

TENDERS FOR CAST-IRON PIPES.

**THE Directors of the above Company** are prepared to receive TENDERS for about 2800 Yards of 15-inch CAST-IRON PIPES and for SPECIALS.
Specification may be had on application to the undersigned.
Sealed Tenders, endorsed "Tender for Pipes," to be addressed to the Chairman and Directors, Gas Offices, Gloucester, and delivered not later than Friday, the 3rd of May next.
The Directors do not bind themselves to accept the lowest or any Tender.

By order,
William E. Vinson, Secretary.

Gas Offices, Eastgate Street, Gloucester,
April 8, 1907.

**NORTHWICH GAS COMPANY.**

**THE Directors of the Northwich Gas** Company invite TENDERS for the supply of about 7000 to 7500 Tons of GAS COAL during the Year ending June 30, 1908.
Full Particulars and printed Forms of Tender may be had on application to the undersigned.
Tenders, endorsed "Coal," are to be sent in addressed to the Chairman by Thursday, May 9, 1907.

Saml. S. Mellor,
Manager and Secretary.

Gas-Works, Northwich,
April 15, 1907.

**MANCHESTER CORPORATION GAS-WORKS.**

TO OIL IMPORTERS AND OTHERS.

**THE Gas Committee of the Corporation** of Manchester are prepared to receive TENDERS for the supply, in Three Cargoes, during the Seven Months ending January, 1908, of 10,000 Tons of OIL for the Manufacture of Carburetted Water Gas.
Description of the Oil, Conditions of Contract, and further Particulars may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent of the Gas Department.
Sealed Tenders and Samples, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Oil," must be delivered at the Office of the Superintendent of the Gas Department, Town Hall, Manchester, on or before Thursday, the 2nd of May, 1907.
The Corporation do not bind themselves to accept the lowest or any Tender.

By order of the Gas Committee,
Wm. Henry Talbot,
Town Clerk.

Town Hall, Manchester,
April 19, 1907.

**HAWKHURST GAS COMPANY, LIMITED.**

**THE Directors invite Tenders for the** supply of 800 Tons of GAS COAL, to be delivered as required to Hawkhurst Station (South-Eastern Railway Company) during the Year ending May 31, 1908.
Additional Particulars may be obtained from the undersigned.
Tenders to be sent in on or before May 7, 1907,

George Morris,
Secretary.

Hawkhurst, Kent,
April 20, 1907.

**TENDER FOR GAS COAL.**

**THE Stamford and St. Martin's Gas** Company invite TENDERS for the supply of 2000, 3000, 4000, or 5000 Tons of Screened GAS COAL.
Quantities to be delivered from time to time as required during the Twelve Months ending June 30, 1908.
Prices in Gas Company's Waggons f.o.r. at pit, and also at Stamford (Great Northern or Midland Railways).
Sealed Tenders, endorsed "Coal Contracts," are to be sent to me not later than Tuesday, May 14, 1907.
No special Forms provided.
The Company do not bind themselves to accept the lowest or any Tender.

H. Green,
Secretary.

Gas-Works, Stamford,
April 20, 1907.

**ACCRINGTON DISTRICT GAS AND WATER BOARD.**

**THIS Board invite Tenders for the** Surplus TAR and AMMONIACAL LIQUOR which may be produced at the Accrington and Great Harwood Gas-Works of the Board during the Year from the 1st of July next to the 30th of June, 1908.
The estimated quantity of Tar is 2000 Tons, and Liquor 6000 Tons.
Sealed Tenders, endorsed "Tar and Liquor," addressed to the Chairman of the Board, must be in my hands on or before Monday, the 6th of May.
Forms of Tender may be obtained on application.

By order,
Charles Harrison,
General Manager.

General Offices, Accrington,
April 20, 1907.

**ACCRINGTON DISTRICT GAS AND WATER BOARD.**

**THIS Board are prepared to receive** TENDERS for the supply of 50,000 Tons of GAS COAL to be delivered free on rail at Accrington and Great Harwood, in such quantities as the General Manager may require during the Twelve Months from the 1st of July next to the 30th of June, 1908.
No special Form of Tender is required; but a full description of the Coal, with a practical working Analysis of the same, must be given.
The Board reserve the right to accept any quantity of the Coal offered, but will not be bound to accept the lowest or any Tender.
Sealed Tenders, endorsed "Tender for Coal," to be sent to A. H. Aitken, Esq., Clerk to the Board, on or before Monday, the 6th of May.

By order,
Charles Harrison,
General Manager.

General Offices, St. James' Street,
Accrington, April 15, 1907.

**EASTBOURNE GAS COMPANY.**

**TENDERS are invited for the purchase** of the Surplus TAR for Sale for the Twelve Months commencing on July 1 next delivered into Contractor's Railway Tanks at the Gas-Works.
Terms, Cash Monthly.
Tenders, endorsed "Tar," should be addressed to the Chairman, Eastbourne Gas Company, not later than May 8.

James S. Garrard,
Secretary.

**TEIGNMOUTH URBAN DISTRICT COUNCIL.**
(Gas Department.)

**THE Urban District Council of** Teignmouth invite TENDERS for filling the empty Arch of a Retort-Bench with six single RETORTS, set on the Shallow Regenerator principle, fitted complete with the required Bench Mountings.
A copy of the Specification may be obtained from the undersigned on payment of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.
Sealed Tenders, endorsed "Retorts," and addressed to A. Percival Dell, Esq., Clerk to the Council, Town Hall, Teignmouth, to be delivered not later than Ten a.m. of Tuesday, the 7th day of May, 1907.
The Council do not bind themselves to accept the lowest or any Tender.

J. Alex. Gray,
Engineer and Manager.

Gas-Works, Teignmouth,
April 15, 1907.